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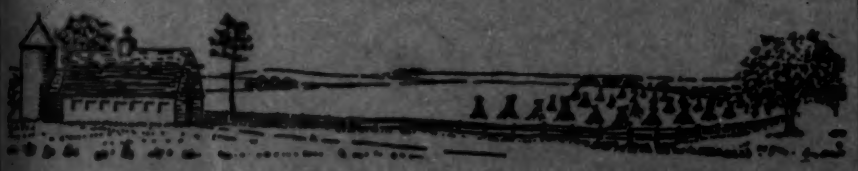

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The Farmer's Digest

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Herd Improvement Through Breeding

Condensed from Guernsey Breeders' Journal

Horace M. Clark

Manager of Langwater Farm

THE life blood of a dairy breed is its farmers and dairymen. The prosperity of these men depends on the ability of their cattle to keep ahead of the "run of the mill" cows of the country. All cattle respond to better care and management, and with pure breds we have the advantage of increased gains as a result of better breeding.

As examples of what can be accomplished by breeding, we have our annual crop of show ring champions, National record cows, and sale ring tops. These animals dramatize breed progress, but are soon forgotten. Champions are beaten, National records are broken, and top prices fall as skillful breeding creates superior animals. Our strength as a breed lies in the capacity of our farmers and dairymen to breed better cattle, regardless of the level from which they start.

Webster's Dictionary defines "breeding" as the propagation of plants and animals. As breeders of pure bred dairy cattle, we must propagate and improve animals if we are to survive in this highly competitive business. Anyone who has a definite ideal of production and type, and breeds cattle that meet this goal, may be truthfully called a successful breeder. The popularity of his cattle will depend upon how closely his ideal conforms to that of the majority of breeders. There will be gradual changes in our ideal from time to time, but as long as the primary purpose of the dairy cow is to produce milk, our first objective will be efficient or low cost productive ability. We have found that to be efficient a dairy cow must have certain characteristics that insure a long and useful life. These characteristics have become well-known through many years of

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careful observation, and when combined are what we call "type." Type is the visible evidence of productive ability.

Breeding is a combination of science, art and luck. Science gives us the laws of genetics, based on discoveries and experiments with plants and small animals. The fundamental principles hold true with cattle, but there are many exceptions and variations. The art of breeding is based on experience, keen observation, and a good memory of the ancestors of the cattle with which we are dealing. As for luck, few will admit it had anything to do with their success, though the evidence is against them. If I named a dozen prominent breeders, each of whom used many bulls in his lifetime, you would instinctively associate the name of that breeder with one particular bull. That is what I mean by luck. It is reasonable to assume that these men used their best judgment in selecting all their bulls, as well as the one that made them famous.

We have improved type rapidly, but high production has not been fixed so easily. Our progress has been hampered by lack of complete information. Seldom do we have records on all members of a cow family or a bull's progeny. This is a handicap, but not nearly as serious as the lack of information about the conditions under which those animals worked, or what is commonly called environment. Our progress has also been retarded by misinformation. I refer to the practice of forcing two-year-olds either to gain quick recognition or to make a bull look like a better sire than he really is. This distorts the apparent breeding value of the bull. Of course, this practice will catch up with the breeder when he begins to prove his next bull. In the meantime, many of the bull's sons have been sold and he may have found his way into a bull ring or artificial insemination association on the strength of the apparent superior ability of his daughters. The directors of these groups now endeavor to be sure that the dams' and daughters' records, offered as proof of a bull, were made under similar conditions.

I believe the two essential factors to success in breeding are (1) healthy cattle and (2) a definite objective. Of course, hard work, common sense, and "know how" will be needed in the process.

Too much cannot be said about the importance of a healthy herd. A man with diseased cattle is working against tremendous odds. They will not produce nor reproduce satisfactorily. They cannot be sold profitably. Even their milk and carcasses must be marketed under restricted conditions. Valuable animals have fallen victim to T. B. Bang's, or Mastitis. Enthusiastic men, who were potential

breeders, have assembled fine herds, and in a few short years dispersed them. Too often the cause of these dispersals was carelessness in assembling the herd. Disease crept in and the owner decided to quit. If we must make additions to our herd, let us be sure they are healthy. Few people can afford the luxury of buying trouble.

A definite objective is necessary, because if we do not know where we are going how are we to know what course to follow? An objective, in this sense, is the animal best suited to the breeder's purpose and circumstances. There is a wide variation in market demands, climate, soil, and management on farms. It is easy to understand why one type of animal might do better than another in a certain place. Most breeders make their living from their cattle. Therefore, these men select cattle that will do best under the conditions at hand. This is one reason why I believe farmers should breed their own herd sires more often than they do. Many times I have seen a farmer point to his best cow and say, "I wish I had a barn full like her." The logical way to get more like her is to use her son for a herd sire. I know this suggestion will not help me nor my friends sell bulls, but it has merit because it eliminates the factor of environment. We know we are breeding from cattle that have done well under our particular conditions.

The selection of the future herd sire, whether purchased or homebred, is the first step in herd improvement. If you believe in breeding, and I do, the pedigree will be more important than the individual. Do not misunderstand me! I do think we should choose a good-looking bull; one with breed character, size, and dairy temperament. He should be especially strong himself, or by inheritance, in the points where our cows show weaknesses. I am not willing to say that we need a show bull. Very few of our outstanding sires have been show bulls, and I might add that few of our famous show bulls have been great sires. This is not inconsistent and is easy to explain. Bulls are judged on their body conformation; but the most important part of a cow is her mammary system, and one cannot tell by looking at a bull what kind of udders he is going to put on his daughters. For that information we must look to his ancestors, the pedigree. We must examine the same source for evidence of production and proof of prepotency. The real test of any bull is his progeny, and in evaluating a young bull the progeny test of his ancestors is the most reliable index we have. If he is backed by three or four generations of proved sires and great brood cows, he carries the best guarantee we can

expect. This would be perfection, and is seldom reached. If there is a hole in the pedigree, but the animals before and after the questionable one are O. K., we might safely make some concession. But, if there are two animals in a direct line that are doubtful, it is a warning to investigate carefully. Next, we want to know that the bull's dams have been uniformly high producers. I would prefer a bull whose first seven dams each had a record over 700 lbs. to one whose first seven dams average over 700 lbs. by virtue of some 1000-lb. and some 400-lb. records. We are breeding individuals and not mathematical averages. Every calf born inherits a group of characteristics from one of its nearby ancestors. It is just as likely to take after one of those 400-lb. dams as it is one of the 1000-lb. dams. Now, while I am talking about 700-lb. records, which, of course, are 365-day, three-time milking records, I want to point out to breeders who are making 305-day, two-time milking records, that a big allowance must be made for the two divisions. If a herd averages around 400 lbs. on 305-day, two-time milking, one cannot expect much help from a bull with less than a 700-lb. inheritance, based on 365-day, three-time milking records.

Pedigrees also give us other information such as progeny, show winnings, classification ratings, and sale prices. The progeny of the various animals in the pedigree are important. This shows the prepotency of these animals or their ability to transmit desirable qualities.

Show winnings of mature animals are significant, but classification is a much more reliable guide as to type because it is based on a national and breed-accepted standard. Classification compares each individual with the entire breed, rather than with a few that happen to be in a certain show ring on a certain day. Furthermore, it gives each cow a fixed rating in general appearance, body capacity, dairy character, and mammary system.

Sales prices are interesting as examples of successful salesmanship. They mean nothing from a breeding standpoint. Merchandising and breeding should not be confused. It is obvious that an animal will not be a better breeder today because it sold for a fabulous price yesterday.

Unfortunately, there is important information not shown on pedigrees. I refer to environment. It makes a lot of difference in a cow's record, whether she is kept in an air-conditioned barn, deeply bedded in a large box stall, fed the best hay money can buy, milked and cared for by the best man who can be hired, or whether she is kept in a cold, drafty barn, tied in a stanchion on a bare plat-

form, fed whatever hay was raised last summer, and machine-milked by regular farm help. These are extreme variations, but all or any combination of the conditions are reflected in a cow's production and must be taken into consideration.

Some men are expert feeders and handlers. We admire the ability of these men, but we should remember that the results of their ability do not go with the bull calf we buy from them.

Everyone has a preference as to the strain or family he wishes to follow. It is good business to stick to the lines most popular in your own locality. Once a line is selected, stay with it, and do not jump from family to family, chasing every rainbow that comes over the horizon. After you get a sound foundation herd, concentrate on your best families and develop a strain of your own.

Within a family, I prefer line-bred bulls, and the only reason I can give is that I have had better success with them. I am sure they breed more true to type. There were many variations and exceptions to the laws of heredity. I firmly believe this number can be greatly reduced by using line-bred bulls.

After the herd sire is chosen come months of patient waiting, and it is excusable if we become enthusiastic over his first calves. Enthusiasm and optimism are wonderful in helping us over the rough places when the going gets tough, but in this business they must be tempered by sound judgment. If livestock breeders have a common fault, that fault is optimism. However, it is too soon to appraise a bull. Unless he is consistently siring a fault that one cannot tolerate, he should be kept until his daughters come into milk. After five, or better still, 10, freshen, we have our answer. If we are exacting in our demands when we selected our bull, we should have a bunch of heifers that average better than their dams. If they do not, then get rid of the bull in a hurry; for the die has been cast, and it is a waste of time to expect his later daughters will be better than the first. This takes courage, but it is well-known that our faster breeders had courage.

Trusting that by careful study and possibly a little luck we have acquired a good bull, the major part of our breeding program has been solved. But no one bull can correct all faults. Some of our generally acknowledged great sires had distinct faults. It would help a great deal if more attention was paid to individual matings. I realize this is impossible when but one bull is kept. Every cow in the herd must be bred to that bull, even though he has the same faults that the cows have. In herds large enough to support two herd sires,

the breeding program is rather routine. One is bred to the daughters of the other and vice versa. If there are three or more bulls available, each mating can and should be carefully studied. A breeder with two or three old bulls knows what each can do and he should make few mistakes.

The greatest aid we can give our bull in the shape of improving the herd is to cull the females. Our cows will represent several different families, and our objective is to concentrate on a few of the better families. As the poorer families are weeded out they are replaced by heifers from the better families. Eventually, all the cows in the herd belong to good families. With a proved sire and good cow families, some progress is assured.

But we cannot stop weeding. Soon some branches of the good families will prove to be better than others, and the process of selection must go on and on. Selection is the basis of breeding. We cast off the unfit and the weaklings. Sometimes we find a great animal where we least expect it. We try out this animal, and if it passes on its virtues, a new star is born and valuable blood is added to the herd. If the animal fails to transmit its desirable qualities, it is just a "sport," and soon passes out of the picture by the process of selection.

Breed progress is slow work. There are no short-cuts.

Seed Treatment of Legumes

Another recent development in the growing of legumes is the *treating* of seed to improve the stand. It's about the same as treating small grains.

In tests with various legumes at the Oklahoma Experiment Station, several compounds including Arasan, Phygon, Spergon, and Dow 9B gave good results. Treating alfalfa and clovers nearly doubled the stands in some cases.

Follow the directions and recommendations of the manufacturer in deciding which one to use on the particular legume you're treating.

Be sure to apply these *before* you inoculate. Otherwise the treatment will kill the bacteria in the inoculant. When seed is treated, the inoculant should be applied *dry*.

Extra Grazing Means Extra Profits

Condensed from New Jersey Farm and Garden

M. A. Sprague

How much are two months of good grazing worth to you? An acre of Balbo rye, barley, or wheat for each three or four grazing animals will stretch your pasture season at least two months in New Jersey.

Many dairy and beef farmers who put aside a few acres for late fall and early spring grazing—"just to try it out"—now have found they can't afford to do without it. They have found that the cost of lengthening the pasture season with plenty of good grazing for six weeks in the fall and three weeks in the spring pays large dividends in more milk and lower feed bills.

At their best, permanent pastures need help during off seasons. Rye or barley sown in late August or early September or rye grass sown broadcast at the last cultivation in corn will offer excellent grazing from the first week of October to the middle or end of November. In some years grazing has continued into December, offering a full two months' extra pasture after the clovers and grasses are finished. Accumulated fall growth may be grazed off during the winter months or saved for late winter grazing on frozen ground.

These same pastures are the first to green up in the spring and in most cases can be grazed for three weeks before turning animals into the permanent pastures. When grazed heavily the previous fall the spring yield of forage will be reduced by about a third from what it would have been had no fall grazing been taken. However, this will still leave plenty of pasture for three or four mature animals per acre.

In southern New Jersey grazing can normally begin in March—or when the plants are five to six inches high. This means almost as soon as the ground dries out enough so the cattle won't mire down. In northern New Jersey spring grazing can usually begin about April 1.

When the grains are pastured and the crop is later harvested for seed, animals should be taken off as soon as the plants begin to "joint." Spring grazing will reduce grain yields by from 20 to 60%, depending on how late in the spring grazing is continued. How-

Reprinted by permission from New Jersey Farm and Garden,
Sea Isle City, New Jersey, August 1949

ever, it must be remembered that the value sought after is from pasture and that grain yields are of secondary importance in this case.

The yield of grain is affected very little by fall grazing. A farmer may wish to pasture his entire acreage of grain in the fall of the year and fence off only a part of his acreage for spring grazing, thus saving the remainder for grain.

Rye is best for pasture purposes in New Jersey. It will produce about twice as much green material as wheat or barley, and three times as much as oats. In the spring it will be ready for grazing four to six days before wheat or barley and almost two weeks ahead of oats.

Balbo is a fast growing variety of rye which has been drawing a lot of attention during the past few years. Experimenters in the Mid-West have found it to be first to reach grazing height in the fall, almost a week earlier than common rye in the spring, and generally more productive.

It is in great favor for pasture purposes, and many dairymen have found less grassy flavor in the milk by using Balbo rye. Where it has been tried Balbo has been praised for its earliness, palatability, carrying capacity, and ability to produce milk.

There are no varieties of wheat or barley especially suited for grazing purposes. The recommended varieties for grain do about as well when sown for pasture.

Growing winter grains for pasture is much the same as growing for seed. Sow Balbo rye or Wong barley at 2 to 2¼ bushels per acre during the last week in August, or wheat at 2¼ bushels per acre after the Hessian fly free date for your area. Fertilizer applications should carry more nitrogen than when grains are sown for seed.

About 400 to 600 pounds per acre of 7-7-7, or a similar fertilizer, is sufficient on most soils. In southern New Jersey late summer seedings of grain may include crimson clover or rye grass. The thick cover of rye grass will help control erosion on soils likely to be soft or wash badly. Can you afford not to make full use of end-of-season pastures?

Poultry House Magic

Condensed from Capper's Farmer

D. C. Kennard
Ohio Agricultural Experiment Station

EVERY poultryman has his own laboratory for manufacturing animal protein factors. With the discovery of the important role played by these magical substances in poultry nutrition, we found a nugget at our feet. APFs, including vitamin B_{12}, are developed by chemical and bacterial action in built-up laying and brooder house litter.

What we have thought was sanitation has been wastefulness. With scoop and broom we have been throwing away what we are willing to pay for in poultry rations. In trying to be clean we have been working against our goals of high egg production, good hatchability, and livability and fast growth of chicks.

Built-up litter has economical, sanitary and nutritional advantages. They have been revealed partly by accident. It took a labor shortage to induce us to leave litter in the house longer than usual. We left all litter under a brood for 12 weeks. They did as well as previous chicks that got fresh litter every 2 weeks. This success led us to try the old litter again. The second brood did even better than the first. To our happy surprise we found the best way to raise chicks is the easiest way.

Chief saving is in labor and materials. Built-up litter is just what the terms implies. It is started with the usual amount of straw. More is added as needed, but none is removed until litter is 8 to 12 inches deep. Occasionally some must be taken out to keep it from growing too deep. But old material often can be put in another house to save the nutritional and health factors that have developed.

Filth is destroyed by chemical action in built-up litter. Fiber and manure decompose and become like compost. In the decomposing processes the animal protein factors or vitamins for health and growth are produced.

Low mortality was one surprising result of built-up litter tests at Ohio Agricultural Experiment Station. Losses from coccidiosis and other diseases in 10 consecutive broods where litter was removed and renewed frequently had been 19 percent of 18,000

Reprinted by permission from Capper's Farmer,
Topeka, Kansas, June 1950

chicks. By contrast, only 7 percent died in 10 consecutive broods on built-up litter.

Poultry floor residue improves with age. Its sanitary qualities reach their best after about the third brood. Loss in the first brood on the old litter was 17 percent; of the second, 10 percent. Average of the next 10 was 5 percent. The practice of raising chicks on built-up litter is growing, but few poultry raisers have followed it long enough to gain its full sanitary benefits.

We have lost very few chicks from dread coccidiosis on built-up litter. This low loss has 3 explanations: (1) Chicks are exposed to the disease and develop resistance to it before they reach the vulnerable age. (2) Organisms causing coccidiosis have natural parasites. Built-up litter provides favorable surroundings for growth of these parasites. (3) Ammonia, a product of manure fermentation, prevents growth of disease organisms in the litter. We know that a spray of 10 percent household ammonia in water is one of the best coccidiosis controls.

There is some indication in Ohio results that built-up litter also offers protection from range paralysis. Losses from this malady have been no higher among chicks brooded on old hen litter than in those raised on fresh litter in isolation from older birds.

Chicks grow faster when litter accumulates. This fact was proved by taking comparative lots of chicks and putting one on old built-up litter and the other in a pen where the floor cover was changed and renewed frequently. Both were fed the same ration of corn, wheat bran, middlings, soybean oil meal, alfalfa meal, meat scraps and dried whey. At 12 weeks those on built-up litter were the heaviest. Also mortality was slightly less on the old residue.

When meat scraps and whey were taken out of the ration, birds on built-up litter weighed 2.34 pounds at 12 weeks compared with 1.64 pounds on fresh changed litter. Loss was 23 percent on fresh litter, due chiefly to coccidiosis, and only 7 percent on the old. Birds on old litter made as much growth without animal proteins in the all-plant ration as those on fresh litter that had the meat and milk supplements.

Built-up litter also works its magic in the laying house. Chicks can be brooded on old hen litter with safety. And hens lay well without having ever set foot on the ground or green growth. Some of the best pullet layers at Ohio station in 1949 were started and raised on litter that had been used by hens for 3 years previously.

Something that makes eggs hatch is also produced in laying house floor residue. We had found from previous experiments that hens on an all-plant diet needed

2½ percent dried whey and 4 percent meat scraps to lay eggs of good hatchability. But their litter was renewed frequently. When Leghorn breeders on an all-plant ration were put on litter that was removed and renewed every 2 weeks, only 27 percent of their eggs hatched. Eggs from similar breeders fed the same diet on built-up litter hatched 72 percent. When the feed on the old litter was supplemented with either 2½ percent dried whey or riboflavin hatchability was raised to 83 percent.

Thus we found that hens on all-plant rations need only riboflavin to produce eggs of maximum hatchability when they are kept on built-up litter. On fresh litter the diet must have both riboflavin and 4 percent animal protein to make eggs of good hatchability.

Management of built-up litter is easy. Any suitable material that doesn't harm poultry, such as chopped straw, wood shavings, sawdust, ground cobs, peat moss and oat or peanut hulls may be used. A reasonable degree of moisture is necessary for bacterial growth and chemical action that produce the sanitary and nutritional elements.

When litter begins to paste or cake over the surface, stir it. If it gets too wet, work in 25 pounds of hydrated lime to 100 square feet of floor space. Fresh material may be scattered over the surface when moisture becomes a problem. Sometimes it is desirable to stir in lime and new straw together.

Experiences reported by poultrymen indicate that built-up litter may work effectively on dirt floors in both brooder and laying houses when surface drainage is good. Discoveries of the merits of this type of litter management have come rapidly. Certainly built-up litter holds secrets yet to be revealed.

Hay For Profit

Condensed from Marketing Activities

W. H. Hosterman

THE old expression "That ain't hay" has lost its significance. Some changes have taken place in farm planning and hay itself that have knocked the bottom out of the phrase. More and more farmers are pointing to improved fields, rich pastures, and mows full of high-protein feed and saying "That *is* hay and I'm proud of it!"

Actually, any feeling that hay was a second-rater among major farm crops has never been warranted. Ranking right behind corn, wheat, and cotton in farm value, hay has not lost ground simply because its one-time top consumer, the horse, is passing out of the picture. The fading demand for hay as a feed for horses and mules has been more than offset by the increased utilization of top-quality hay as a relatively cheap source of protein for cattle and sheep. Moreover, in figuring the overall importance of hay and grasses no one can afford to overlook their incalculable value as soil builders and controllers of erosion and drought.

Both conservationists and marketing economists in the U. S. Department of Agriculture know, however, that hay must sell itself on its value as a money-maker in year-to-year farm operations, rather than in its role as a soil rebuilder and erosion controller.

Feeding experiments which have been conducted from time to time in different sections of the country show hay to be a relatively inexpensive source of nutrients. In New Jersey 100 pounds of total digestible nutrients cost $4.23 when supplied in concentrates, $3.35 when supplied in hay, $2.07 when supplied in silage, and $1.14 when supplied in pasture. At Huntley, Montana, 100 lbs. of total digestible nutrients cost $1.20 when supplied in barley, $1.03 when supplied in corn silage, $0.64 when supplied in alfalfa hay, and $0.37 when supplied in pasture. An analysis of costs of 100 lbs. of total digestible nutrients from published reports of farm management surveys made by the Bureau of Dairy Industry, U. S. Department of Agriculture, give the following figures: barley $1.70, corn (silage) $1.54, timothy hay $1.21, clover hay $0.97, alfalfa hay $0.83, and pasture $0.64.

With overall agricultural planning shifting toward greater live-

Reprinted from Marketing Activities,
Washington, D. C., April 1950

stock numbers, hay crops and pasture improvement programs are ideally suited to fill the gaps left by acres diverted from cash grain crops. Most of the hay produced in the United States is fed on the farm where grown. Of the 1948 crop about 13 percent was sold from the farm on which it was produced; but no information is available on the quantity moving in commercial channels or for use on nearby farms.

This movement of the 1948-crop hay from the farm on which it was produced varied, among different areas, from 4 percent in North Dakota to 60 percent in Arizona. In the Middle Atlantic and East North Central States about 10 percent of the crop was sold. In the dairy State of Wisconsin, less than 5 percent was sold. In Idaho, Nevada, Colorado, and New Mexico, where much livestock is summered in the mountains and brought down into the valleys for the winter, about 25 percent of the hay normally leaves the farm. A similar proportion moves from the farm in Washington and Oregon, where much alfalfa hay is grown east of the Cascade Mountains, while most of the dairies are located west of the range. In California where dairying is concentrated near the large cities and where alfalfa is grown chiefly in the irrigated valleys, about 37 percent of the hay is sold.

The fact that dairy cattle consume about 53 percent of the total hay crop is the basis for this movement toward dairying regions. Beef cattle consume about 19 percent of this amount, sheep about 6 percent, horses and mules about 20 percent, and other livestock about 2 percent. In the breakdown of all feed consumed by separate groups of livestock hay makes up 26 percent of the total for dairy cattle, 14 percent for beef cattle, 12 percent for sheep and goats, and 33 percent for horses. Of the total feed supply for animals the hay crop furnishes about 15 percent.

Wherever hay has played a major role in successful farm feeding operations one common rule holds good: The quality of the hay must be high. Because feeding value in hay is tied so closely to quality there is good evidence that for many farmers the more economical way to increase the farm feed supply would be to improve hay quality through better cultural and curing practices, rather than through increased acreages. While weather conditions strongly affect hay quality, it has been observed that certain farmers in a given region consistently put up good hay.

If farmers gave the same thought to improving the quality of hay that they have given to improvement of other farm crops—especially those they sell for cash—the feed value of the crop would

be materially increased. Those farmers who plan to change their farm operations to include more grassland will find it profitable to produce quality hay for winter feed.

A reflection of the trend toward production of hay of higher feed value may be found in the recent increases in the more highly nutritive kinds such as alfalfa and lespedeza. Selection of variety, of course, may first be regulated by climatic and soil conditions. Of the total of 99,305,000 tons of hay harvested from 72,835,000 acres in 1949 about 39 percent was alfalfa hay, 25 percent timothy and clover mixture, 12 percent prairie hay, and about 9 percent was lespedeza. The remainder consisted of miscellaneous kinds such as Johnson hay and soybean hay.

Alfalfa is grown in almost every State. In 1949, thirteen States each produced 1 million tons or more of alfalfa hay. Most of these States were located either in the north central region or the western region where soils and climate are most favorable for alfalfa production. In recent years alfalfa hay production has also increased in the Northeastern States and in Maryland and Virginia although the increase has not been as great as in the North Central States.

Production of timothy and clover hay has declined in recent years though it is the second crop from a production standpoint. Since timothy and clover are usually grown together the production or proportion of each of these kinds of hay cannot be ascertained. Clover, red, alsike, and white, probably makes up more than half of the total because these kinds of hay are prevalent in the States where dairying is the important farm enterprise and hays containing a maximum percentage of legumes are preferred. Timothy and clover hay will continue to be the principal kind of hay in those areas where good stands of alfalfa are difficult to obtain. It is relatively easy to obtain good stands of timothy in most of the area north of the Potomac and Ohio rivers and east of the Missouri River—a situation which assures a hay crop if the clover portion of the mixture is lost because of adverse weather conditions during the winter.

Lespedeza hay is produced to the greatest extent in a belt extending from Virginia and North Carolina on the east, to eastern Kansas and Oklahoma on the west. It is a legume that will grow on soils of a lower fertility level than the clovers and alfalfa, although it will respond to lime and fertilizer. Lespedeza, with the exception of the Sericea variety, is an annual, the seeds of which germinate and start to grow rather late in the spring. Under these conditions weeds often are a problem from a quality standpoint.

The crop is often seeded with oats or in winter wheat which tends to reduce the weed content, but when harvesting following the grain crop the hay may contain a high percentage of straw or grain stubble.

Prairie hay production is confined largely to prairie and Great Plains States. It is made up of the native grasses harvested from the areas where the native sod has not been destroyed by plowing.

The remainder of the hay crop is made up of various kinds of plants suitable for hay, none of which are important except in rather restricted localities.

In an effort to bring about a more direct relationship between hay quality and price, and thus stabilize marketing, studies in hay standardization were begun in 1919 under the annual appropriation act for the United States Department of Agriculture. Grades for timothy and clover hay were issued in 1922 and the standardization studies were extended to other kinds of hay in 1923. The research has been continued through the years and at the present time there are standards for eleven groups of hay as follows: Alfalfa and Alfalfa Mixed Hay, Timothy and Clover Hay, Prairie Hay, Johnson and John Mixed Hay, Grain, Wild Oat, Vetch, and Grain Mixed Hay, Lespedeza and Lespedeza Mixed Hay, Soybean and Soybean Mixed Hay, Cowpea and Cowpea Mixed Hay, Peanut and Peanut Mixed Hay, Grass Hay, and Mixed Hay.

The National Hay Association and the New York Hay and Grain Dealers Association both have adopted the Federal hay standards and are using the standards as the basis of trading in those cases where specific grades and classes are quoted. However, many dealers continue to use descriptive terms when describing hay because they feel that dealers in certain areas are not thoroughly conversant with the standards. A number of schools have been held for the members of the hay trade during the last few years in an effort to familiarize the handlers of hay so they can use the standards as a basis of trading. Interest at these schools has been high. Dealers who have traded in hay for 20–30 years have been eager to test their "grading eye" and work with new testing techniques.

The standards are also used to determine both the quality of hay produced under controlled production experiments, and the quality of hay used in various feeding experiments.

In New Jersey samples were taken from the hay the farmers had produced on the farm and were feeding to dairy cattle. Samples were taken at monthly intervals (November to March 1948, and again in 1949) from the barns of 10 farmers in each of 8 counties.

These samples were graded each month shortly after they had been collected. A total of 1,100 samples, were graded, of which 17 percent graded U. S. No. 1, 46 percent graded U. S. No. 2, 18 percent graded U. S. No. 3, 17 percent graded U. S. Sample grade, and 2 percent did not classify as hay under the standards. The breakdown by classes indicates that the New Jersey farmer is growing considerable legume hay for dairy feeding. Thirty-seven percent of the samples classed as alfalfa or alfalfa mixtures, 8 percent as clover or a mixture in which clover predominated, and 35 percent as timothy or a mixture in which timothy predominated. The remainder consisted of odds and ends, such as grass hay and soybean hay.

The standards are also used to determine the quality of hay used in feeding tests by the Bureau of Dairy Industry and a number of the State agricultural experiment stations. Currently a cooperative project between the Bureau of Dairy Industry and the Production and Marketing Administration is examining the correlation between grade of hay and feed value. This study is authorized and financed under the Research and Marketing Act of 1946. So far comparisons between U. S. No. 2 and U. S. No. 3, Alfalfa fed for milk production and calf growth have not shown much difference in favor of the U. S. No. 2 Alfalfa. Preliminary results with U. S. No. 1 and U. S. No. 3 Alfalfa being fed to dairy heifers in other trials this year at Beltsville indicate that U. S. No. 1 is superior to U. S. No. 3 in promoting growth as measured by gains in body weight.

In order to insure that adequate trained personnel will be available to provide grading service in the hay trade throughout the country a Federal hay-inspection service is conducted by the Grain Branch of the Production and Marketing Administration. The general plan for this service provides for the employment of Federal or Federal-State hay inspectors at important central markets, and at shipping points under cooperative agreements between PMA and organizations such as State departments of agriculture, commercial exchanges, and dealers' or growers' associations.

The work of the local inspectors is guided by supervising inspectors located at central points in the large hay producing and consuming areas. These supervising inspectors, or other employees of the Grain Branch, are available at certain points to make examinations if no inspector employed by a cooperating agency is available. Producers, dealers, and consumers also benefit from the educational work readily provided by inspectors for both the hay and the straw standards and inspection service.

Poor Land Legume

Condensed from The Progressive Farmer

H. I. West

"ANSWER to the cattleman's prayer"; "will graze two cows per acre"; "makes 17-20 tons green matter per acre"; "has a feeding value comparable to alfalfa"—these are some of the claims made for hairy indigo.

George E. Ritchey, agronomist of the Florida Experiment Station, Gainesville, says, "This plant has become very popular with citrus growers and cattlemen of this state. Citrus growers are using it as a cover crop, the cattlemen as a grazing crop, and general farmers as a cover crop in connection with grains and other crops. Its feeding value compares fairly well with alfalfa, but it is not as high in food value."

Two strains are grown, an early and a late one. Prior to 1943 only the late strain was available which, no doubt, accounts for most of the acreage being in Central Florida. Since the early strain has been developed, it has been successfully grown as far north as Central Alabama and Georgia. The acreage to date is about 60,000 in Florida with a few scattered hundreds in Baldwin, Clarke, and Houston counties in Alabama.

The board of supervisors of the Chipola River Soil Conservation District, comprising the counties of Jackson and Calhoun in Florida, at its January meeting, went on record as recommending it to every farmer in that district. The board also agreed to procure 5 tons of seed for distribution in that territory for 1950 planting. According to S. L. Morrow, supervisor in chief, "Hairy indigo is destined to supplant crotalaria entirely. It has none of the toxic effects of crotalaria, makes as much or more growth, and can be utilized as a grazing and emergency hay crop if necessary."

Hairy indigo requires no inoculation, no special soil type, and no special fertilizers; does not need liming; resists diseases and insects; will grow in corn; and will outfight grass and weeds. It seems to do exceedingly well on light soils, much as crotalaria does, but makes more growth. It is a warm-weather crop requiring a fairly long growing season.

This leguminous plant is a native of the tropics. It was first introduced in 1908 by the USDA and again in 1914 and 1916. It

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does not appear in the records again until 1931 when a small plant was found growing at the Florida Experiment Station. A few years later, more introductions were made. Until 1943, plantings were limited to Central Florida. Then an early strain was developed. Two years later plantings had spread to North and West Florida and it now seems destined to spread all along the southern part of Alabama and Georgia.

In Baldwin County, Alabama, it is being grown to some extent by veterans in the Elberta district, with some very good results. C. E. Gearhart, their supervisor, became interested three years ago. That year, the boys planted 29 acres as a trial. The next year they increased their acreage to 169 and were able to sell a surplus of 3,000 pounds of seed at 50 cents per pound.

J. B. Foley, a Baldwin County dairyman, used it as a supplementary pasture from August to November last year. When his white clover and Dallis grass began to get short, he was able to turn in on the indigo with no loss in milk production—in fact, the cows made some gain. This year he plans on doubling his acreage.

E. N. Stephens, county agent of Escambia County, Florida, says it is now on Escambia's PMA program. Last year 51 farmers raised about 700 acres. For 1950 they plan on at least a 50 per cent increase. One of the county's dairymen, Eugene Sunday, grazed 15 cows on 8 acres and, as he says, "They never caught up with the indigo." He is planning on 60 acres for 1950. Mr. Stephens says there is no reason it can't be ground and used in place of high-priced alfalfa meal they have to import.

Where will this plant fit in? First as a soil builder. Crops following it have shown a wonderful increase. Corn yields have been doubled the following year. It shows up well with oats and other winter crops.

A second important use is as a grazing and hay crop. It can be seeded alone and will fill the gap when other pasture crops get short in late summer and early fall. If used as a hay crop, cut while the plants are young and tender.

It will grow anywhere. This is the poor soils legume. While most legumes require good land, this one seems to thrive where others will not grow at all. As one man said, "You can clear up a patch of blackjack oak, plant the land to hairy indigo, and it will make good growth."

When planted in the cornfield, it needs no fertilizer. If planted alone, 400 to 600 pounds of 0-10-10 or 0-14-10 are recommended. Lime will help some, but is not necessary.

The rate of seeding varies from 3 to 5 pounds in cornfields to 6 to 10 pounds when planted alone.

As the seed are very small, don't plant too deeply. Where indigo is planted alone, a good practice is to roll the ground or use a cultipacker after seeding.

This plant is not a pest and will not cause trouble in a soybean crop the following year, as crotalaria will do. It does not interfere with any corn-harvesting machinery. Cattle grazed on it will not bloat, as they are apt to do on clovers. It often reseeds itself, but not enough to count on.

Long-Wearing Dairy Cows

Condensed from Breeder's Gazette

G. A. Bowling
Manager of Strathglass Farm

THERE is something more important in a young cow than a high first lactation record. Just as a "flash in the pan" is of short duration, too often the high producing heifer never again equals her first lactation.

Scientists have shown that slow growth on the average means longer life. It appears that the heifer of proper conformation and dependable pedigree which starts out at a moderate level of production may wear longer, and during her lifetime will produce a greater total volume of milk than the heifer that matures quickly but wears out quickly. Also please notice that those dairy cows living to a ripe old age and producing at a profitable level, possess the essentials of good conformation that cannot be minimized even by those statisticians who question the close relationship between type and production. Indications of a strong constitution, a deep middle, a strong loin, straight legs with sound feet, and a well-attached symmetrical udder are essential in the long-wearing dairy cow.

Proof of this fact is illustrated in a group of ten cows at Strathglass Farm, Port Chester, N. Y. These ten cows have produced a combined lifetime total of more than a million pounds of milk! These cows, averaging 14 years of age, had an actual average production of 10,477 lbs. of milk with 415 lbs. butterfat for their most recent ten-months lactation, all completed in 1949. All cows were milked twice daily. These records are convincing proof that type plus production, plus long

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life, are an unbeatable combination for the dairy farmer.

These ten cows at Strathglass Farm are not exceptional because of high milk production. Five hundred Ayrshire cows have each produced over 100,000 lbs. of milk. It is unusual, however, to find on one farm, 10 cows that have produced a total of 1,000,000 pounds. When we find that this same farm has bred or developed a tenth of all of the 50-ton producers in the breed, however, we should begin to look for the reasons why.

Years ago Strathglass Farm was convinced that the dairy farmer of the future must milk cows that would give more milk—and last longer. More milk per cow would be needed to meet the current expenses of dairy farming; and a longer-lived cow would be necessary in order that replacements, one of the major overhead costs, might be reduced greatly. Located only 25 miles from the heart of New York City, Strathglass Farm felt the effects of increasing land values, high taxes, dearly-priced concentrates and competitive city wages before these factors began to touch the average herds throughout the country. A compensating breeding program coupled with herd management designed to meet these factors beyond the control of the individual dairyman, appeared to be the only sound basis for continued operations.

An early appreciation of true Ayrshire conformation that has been adhered to constantly in the selection of bulls and foundation females has contributed very much to the building of the long-wearing cows at Strathglass Farm. Of course, production was always important, but it was believed that an efficient, long-wearing machine must be built right; faulty design in breed type could be as disastrous as an unbalanced motor. Another fundamental bit of thinking back of this program is that body and production should mature together. The 7-thousand to 8-thousand pound 2-year-olds, if of proper conformation and correct pedigree, have a good chance of being the old cows of which one will be proud. Strathglass Lucky Puff made only 8,000 lbs. as a 2-year-old, yet she went on to become the long-distance butterfat producer of the Ayrshire breed, with 189,846 lbs. milk and 7,598 lbs. butterfat. Strathglass Brown Peg was a disappointing 2-year-old, yet became a breed champion. The grandam of a present Strathglass herd sire produced only 7,500 lbs as a 2-year-old, but made over 100,000 lbs. in her lifetime, and made one record of over 1000 lbs. butterfat. These cows had the correct type, however, for each was classified Excellent, and each had the right kind of pedigree.

These long-wearing cows at Strathglass did not happen by chance. All of them were by proven sires. Four of them are by a sire whose dam had produced a total of 131,860 lbs. of milk during 13 lactations in Scotland. Her sire in turn was out of a dam that had produced 125,123 lbs. milk. Four of the cows are out of dams that had produced over 100,000 lbs., and they were approved by the Ayrshire Breeders' Ass'n as outstanding brood cows. Considering the fact that the average life of a dairy cow is about six years and that injuries and breeding troubles, as well as many types of infections, take a heavy toll, it is apparent that where there are dam and daughter combinations which have stood up under the onslaught of all of these destructive influences, they must possess some inherent superior qualities which should give rise to a long-lived strain of cow.

Strathglass Farm has not followed constantly any set system of breeding, but for 39 years the objective has been to have the best there is in Ayrshire inheritance, and to husband it to the best interests of the breed. The records show that, following this program, Strathglass Farm has bred or developed more Approved Ayrshire sires, more Approved Ayrshire dams and more cows that have produced over 100,000 lbs. milk than any other Ayrshire herd now in existence. The herd has been tested continuously for 22 years in the Ayrshire Herd Test, and over that period of time has averaged 9,531 lbs. of milk with 390 lbs. fat for 69 cows milked only twice daily. While making last year's record the herd was given an official type rating of 88.3%, the highest average score in the country for herds of from 75 to 100 cows. It all adds up to the fact that Type + Production and Health + Longevity is the soundest basis on which you or any other dairy farmer can develop a breeding program.

How To Have Healthier Pigs

Condensed from Successful Farming

Dr. K. W. Stouder
Iowa State College

THE troubles of newborn pigs are not all due to diseases; some of them are nutritional. Often the two overlap.

Anemia is almost sure to come if pigs are raised on wood or cement floors. Most of this trouble is due to lack of sufficient iron intake with the food. Since the sow's milk is almost devoid of iron, her pigs must get it from some other source.

Make a solution of iron sulfate, 25 percent; copper sulfate, 2 percent; and water, 73 percent, by weight. Paint or swab this on the udders of the sow during the suckling period.

Some men put clean sod or dirt in the pens. Another method of getting iron to the pigs is to mix 4 ounces of finely powdered copper sulfate with 2 pounds of powdered iron sulfate and 100 pounds of air-slaked lime, fine sand, or fuller's earth. Dust this in the bedding.

Some farmers give iron pills to the pigs.

Hypoglycemia is another common reason for baby pig losses. Caused by low blood sugar content, this ailment results in loss of appetite, indifference, and a marked reduction in vigor. It often follows chilling, but there may be other causes.

Left alone, the pigs will die, for they fail to suck. But, if the condition is called to the attention of a veterinarian, many pigs will be saved by supplying immediate nourishment. This is done with into-the-belly shots of 5 to 10 c.c. of a 50-percent, specially prepared solution of glucose or dextrose in sterile water. Follow this by putting them in a warm place with some additional feeding of cow's milk or this glucose solution.

It is not difficult to learn the technique of into-the-belly injections, and some veterinarians, desiring to save as many pigs as possible, leave equipment and supplies with hog men, who, under their guidance, can use this when needed.

Cross sows and poor milkers result in considerable pig losses. To quiet the vicious sow or to start milk flow, veterinarians inject some of the extract from the pituitary gland, and normal milk flow often will begin in a matter of a

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Des Moines, Iowa, May 1950

few minutes. The temper and attitude of the mother changes as quickly.

In many instances this injection, accompanied by hot and cold packs alternately to the udder, is the best treatment yet found for caked udders and mastitis in the sow. This treatment must be used early in any of these conditions to get desired results.

Sore mouth and bullnose are responsible for many runts and lost pigs. Most of the trouble starts from wounds of the mouth and face made by the small tusk teeth.

Catch the pigs and examine the mouths occasionally. If red, angry spots or small yellow ulcers are seen in the mouth lining or skin of the face, suspect that the pigs are fighting. Treat these wounds immediately with some tincture of iodine applied with a small swab of cotton on a small stick. Cut off the tusk teeth to stop the injuries. Dunk the pigs daily, head first, in a solution of 1 percent copper sulfate in water.

When the older pigs develop bullnose and breathe with difficulty or frequently sneeze and sniffle, it's a sign that inhaled dust laden with germs aided by a virus has weakened the tissues of the upper nostrils. Nothing can be done to check it. Don't keep for breeding stock any of a herd that has suffered from this.

Best time to castrate pigs is a subject often debated among hog raisers. Carl Anderson, near Wellman, Iowa, has raised hogs for 38 years, and says that it is a "must" to castrate all the males at one week of age. They are easily handled, show no shock at all, and lose very little blood. He says that he has never had a callous or tumor on a pig castrated at this age.

Make the wounds so low that, when the pig is standing and you look at him from behind, you cannot see the lower or forward end of the slit. This insures good drainage of the wound.

Pull the testicle out. This breaks off the cord, insuring less hemorrhage. A cord that breaks off high up in the canal cannot become infected. It is an infected cord end that results in the castration tumor which follows so many jobs of castration.

Use clean instruments and disinfect the skin before the incision is made. Pigs turned into clean maternity stalls run small chance of infected wounds.

Big roundworms do much greater damage to the internal organs of a pig than most folks realize.

Sodium fluoride is a very effective vermifuge and easy to give. Find out how much dry feed a given lot of pigs will eat in a day and add ¾ pound of the drug to each 100 pounds of feed. If the pigs do not eat it all, mix what is left with the next day's feed.

Don't fast the pigs previously and don't use this drug in wet feed or slops.

Every lot of pigs should be treated preferably when they weigh between 50 and 60 pounds. If many worms are passed, repeat the treatment in one month.

Mange is easy to kill with benzene hexachloride. This chemical is insoluble in water but can be obtained mixed with some wetting agent.

Follow directions or see that you have .25 percent or less gamma isomer of benzene hexachloride in the water. Spray or dip the animals thoroughly.

Usually one treatment will do the job, but repeat if necessary. To get a good cleanup, treat the buildings, too. The better preparations leave only a slight musty odor which vanishes from hogs in two or three days. These preparations will also kill hog lice.

Hog cholera sometimes strikes small suckling pigs, although pigs from immune sows usually will resist as long as they are living mostly on their mother's milk.

The best time to vaccinate the pig is a much-discussed question, but the most widespread custom is to give the treatment when the pig is from six to eight weeks of age. This is close to weaning age for most pigs, and some authorities say a week or so before and others a week or so after weaning. This size of pig demands about the minimum of serum to insure long-lasting immunity and gets the pig when small and easy to handle.

Beside the factor of age, keep in mind that it is important that the pig be in good condition, free from evidences of ailments or other infections, especially bowel diseases and upsets. Overlooking that point resulted in heavy losses on some Midwestern farms last summer. The disadvantage of serum and virus treatment is that the virus infects the premises with cholera.

There are two relatively new products for immunizing hogs against cholera. One is known as the B.T.V. and the other as crystal violet vaccine. Their advantages are that they do not bring cholera infection onto the premises, and they do not shock the animals' health so severely, so there is no need of cutting the feed. Even animals suffering from some mild digestive derangements are seldom aggravated.

Do not use these vaccines on hogs that have been exposed to hog cholera or are likely to be exposed for three weeks. That much time is required to develop immunity. Since the expected duration of immunity is six to eight months, hogs kept as breeding stock need another treatment.

These new vaccines definitely have a place in hog raising, and we will see an increase in their

use. Until recently, crystal violet was available only through a veterinarian, but one pharmaceutical house now is selling directly to farmers.

Necro, enteritis, necrotic enteritis, and chronic scours are all names given to one of the most common ailments of young pigs and shoats. The causes are several. They include lack of labor to keep the pens clean, lack of feeding facilities or watering equipment, poor water supply, changing weather, chill, virus reaction following vaccination, and shock to a pig, as from weaning.

From a nutritional angle, the causes may be an inadequate or unbalanced diet, such as too much corn or no animal protein in the ration, or a deficiency of Vitamin A or the B-complex vitamins.

Pig pellagra or the form of chronic scours due to improper diet, as shown by the Michigan and Wisconsin experiment stations, can be largely prevented and often corrected by feeding more oats and better protein feeds, instead of so much corn. These stations proved that the protein must be above 14 percent to insure safety against this form of enteritis in the small pig, and some of it should be of animal origin. Here also is a place for using APF, due to its high Vitamin-B-complex content.

Another form of necro is caused by too great an intake of harmful germs with food or water, due to unsanitary conditions of living. It is best corrected by improving the sanitation and adding alkalinizing agents to the feed and water.

A widely used home remedy is 1 pound of salt to each 5 gallons of buttermilk. Allow a good fill of this every day, but be sure to keep close at hand a good supply of water. To each 50 gallons of this water, add 6 ounces of a hypochlorite solution. Soak oats in the milk and salt for feed, and bring the pigs back to full feed slowly.

The bloody scours is usually acute and acts swiftly, so sort the herd quickly and remove those which still seem healthy. Stop the feed and flush the pigs with 1 pound of baking soda to each 10 gallons of water. Scrub the floors with the strong hypochlorite solutions or lye water.

If the pigs can be kept on clean cement floors it helps greatly, while injections of anti-hog-cholera serum will help to sustain them. These pigs are dehydrated, so into-the-belly injections of combinations of the sulfa drugs and dextrose, along with the dosing with sodium sulfathiazole or sulfapyridine, are also a good treatment. However, this treatment should only be used under the watchful care of a veterinarian who can determine just how much will be beneficial, and where to stop.

Bring the pigs back to a full

feed slowly and sparingly, especially with respect to corn. Dried brewers' yeast, fish meal, liver meal, and APF are all beneficial in the diet of pigs that have had necro. Never keep animals that have suffered from this disease as breeding animals.

Baby pig disease is a term that covers several different conditions. Recent studies indicate that there is one virus-caused disease now known as "infectious gastro-enteritis." It starts during the first days of life, comes with a sudden onset, and heavy death loss always results.

There is abundant evidence that it is easily spread from litter to litter and that the principal symptom in the small pigs is scours, accompanied by acute inflammation of the stomach and intestines. At the onset, pigs are subject to severe shivering and vomiting; then they get dull and listless, show no desire to nurse, and crawl away to hide in the bedding. They usually die in 24 hours after the first symptoms are noticed.

It is most deadly when it shows up on the first or second day of the pig's life, for few pigs of the litter live. Those that do may die a week to a month later. These older pigs show very red stomach lining, a thickened intestinal wall that is inflamed and red, and also congested kidneys. The few that live a few weeks longer are undersized and in poor condition, even though on good rations.

Because this disease seems to occur less in the litters of sows on grass, investigators at the Missouri Experiment Station have suggested the possibility that, while a virus may be largely responsible for it, some vitamin deficiency is also a contributing factor.

If baby pig disease starts in your lots, do all in your power to cut off communication between that pen and all others on the place, even to having separate attendants. No effective treatment is known. Older hogs may suffer from this virus, but seldom die.

Scours is a symptom only, and not a disease in itself. The causes are several.

It may be that the pig was chilled at birth, or soon after. Inadequate or unbalanced diet of the mother during gestation often results in undersized, weak pigs, which are far more likely to suffer. Anemia is a contributing cause. Digestive upsets of the mother may scour the pigs.

There are a few specific diseases of the mother, particularly brucellosis, where the pigs are carried to full term but are weak and hence fall ready victims to scours soon after birth. This form has often been termed "white scours," and it occurs early in life, with high mortality.

Pigs require much more Vita-

min A in cold weather. This may explain why pigs born in dark, damp, or drafty pens not only cannot sleep and rest in comfort but also suffer from scours. They also are exposed to more filth germs when the sow lies down to let them suckle. The intestine is infected, so the food decomposes and the pigs scour. Some digestive upsets are caused by a lack of enough vitamin intake, such as niacin and Vitamins A and C, to help fortify the intestinal walls against invading bacteria.

Overloading the stomach of hungry animals with excessive amounts of food is a frequent cause of scours, particularly in the orphan pig not fed often enough or fed unclean foods.

When scours occur before the pigs are three days old, it is fatal to many, no matter what the cause, as it weakens the small infant and pneumonia sets in.

If it appears that the nutrition of the sow may be responsible, feeding her a tablespoonful of baking soda in the drinking water twice daily, or a spoonful of dried blood as often, may improve matters. Others like to put a half ounce of formalin in the sow's ration twice daily for a day or two. Reducing her rations to whole oats for a few days frequently proves beneficial. Where it is a follow-up to abortion or brucellosis infection, little can be done, though antiserums are sometimes used.

Swine pox is a virus-caused disease, spread largely by hog lice. Some attacks are mild, but they always give the herd a severe setback and may kill a few. Severe complications and some deaths are the rule if pox is present when pigs are vaccinated with hog cholera virus.

It starts as small red spots which soon become water-filled blisters. These later burst, leaving a small, sharply outlined circle of raw, open sore. If these become soiled and infected with filth and dirt, pus germs may develop there and the pigs grow very sick. They are all off feed and have a fever, shrink in weight, and are weak. The raw sores scab over, and finally the scabs fall off, leaving a light spot on the skin.

If kept clean and given good care, the majority will recover, but protect them from bad weather and avoid any operations until they do.

Erysipelas has now spread all over the Cornbelt. It resembles cholera and may occur in a very acute form most often seen in very young pigs, a milder, slower-acting form, or very chronic form with little or no death loss.

The acute form can often be handled by injections of anti-hog-cholera serum, or better, anti-erysipelas serum. Some outbreaks re-

quire use of the anti-erysipelas serum combined with the culture of the germ to build higher, longer-lasting immunity. But we never should use the culture of the germs on premises where the disease has not already established itself. Even this system does not establish a lifetime immunity.

In recent years some improvement has been made in treating the acute outbreaks of erysipelas by combining anti-erysipelas serum and penicillin.

Fitting For Sale

Condensed from The Hereford Journal

Eugene E. Johnson

WHEN a person is starting in the cattle business and selling publicly for the first time, he must bear in mind that the animals he offers for sale are, in the eyes of the public, the criterion of his herd at home.

Success in any line of business, where some product must be sold, demands advertising. Your cattle are advertising for you when you enter them for sale. This may be good or it may be bad. The practice of selling inferior registered animals for reproductive purposes is dangerous not only for your future business, but for the industry. The smaller the number of poor-quality animals that a breeder will permit to be offered for sale out of his herd, the better will become his reputation as a producer of desirable seed stock and the stronger will become the demand for his product. There is no substitute for quality. Every breeder should remember that a satisfied purchaser can be the breeder's best advertising medium.

There are two principal methods of selling registered beef cattle: through public auction sales and through private treaty sales. Private treaty selling may be done by dealing in person or by mail order. Public auction sales may be classified into three kinds: The individual breeder sale, the combination sale and the consignment sale.

No matter how one is planning on selling his cattle it is most important to have the cattle in the best selling condition possible.

From the time calves are dropped one should have an eye on them so as to detect their possibilities as soon as possible. Early

Reprinted by permission from The American Hereford Journal, Kansas City, Missouri, July 1, 1949

selection of an animal of desirable type, careful feeding from a young age so it will have every possible chance to develop normally, lots of grooming, and plenty of exercise and foot care are the important rules in fitting a sale animal. Dividends will be collected on the day of the sale as well as in the future if these fundamentals are followed.

Heifers that will be sold open, or yearlings, should be started early and given every opportunity to develop. If the dams are on good pasture it is often possible to creep feed the calves to supplement the milk they are getting. If the pastures are arranged near the barns or corral they can be nursed twice a day and have access to grains, hay and pasture during the rest of the time. Shelled corn and whole oats are very good to start calves on as they seem to like to chew on the whole grain. When they start to eat a good amount of grain daily, coarsely ground grain can be substituted for the whole grain. And as the mothers of the calves start to drop off on their milk, a little protein in the shape of some good calf pellets will bring the calves along to weaning time in such condition that they will not miss the milk very much.

The heifers and bulls should be separated a little before weaning time and calves looked over closely for show or sale prospects. Those selected should be put up in small groups and be started on a fitting ration. We have found that a ration consisting of 2 parts corn (cracked or cooked), 1 part oats (rolled or coarsely ground), 1 part bran, ½ part beet pulp soaked in molasses water and ½ part protein is about as good a feed for bringing sale animals along as any.

It should be remembered that no fixed rule can be laid down for fitting calves for show or sale. Each animal must be fed and handled to suit its likes and dislikes so far as possible. It is not necessary that a special variety of feeds be used in any case, for feeds may be selected according to the available supply and cost. Oat and wheat brans are always good feed to use and usually can be secured in almost any section of the country. Yearlings and two-year-olds being fitted for sale do not need milk for a supplement to their grain ration. For yearlings and two-year-old animals the grain should be ground so they will get the full benefit of their feeds through the process of digestion.

It is advisable to halter break both the bull and heifer calves as soon as they are put in the barn to be fitted for sale as they are more easily handled while small and will respond to feed much better if they are gentle and over any nervousness.

Too many animals get to the sale-ring in an overly fitted con-

dition that comes from too lengthy a diet of corn. Watch the animals and if they start to become harsh hided and the flesh becomes hard, increase the bulk in the ration. Needless to say it is important that they have access to clean, fresh water and salt at all times. As to the need of adding minerals to the feed, it is possible that in some instances it might be of value. But when the feed is grown on well fortified soil, the grain and roughage probably will carry sufficient mineral.

One should always feed the best-quality roughage available. Young calves need not receive a large amount of hay but it should be green, leafy and of good texture.

Selling heifers of breeding age often presents the problem of whether to sell them bred or open. In deciding this, one should as nearly as possible analyze the prospective market. If the demand at home has been for bred heifers, it is a pretty safe guess that the same will apply at a sale, particularly if your herd-bull battery is of popular breeding and of good type.

Exercise is a vital need for keeping sale animals active, alert, and sound of feet and legs. Outdoor lots or paddocks are good to turn in at night in the summertime and in day-time during the winter.

Horns should be properly trained as soon as they are large enough to hold weights and great care should be used to prevent over-weighting. Weights should not be left on until the horns are at the desired position but should be taken off as soon as they start downward, as they will usually continue to grow downward once they are started. A trim, neatly-curved horn undeniably adds a great deal to the attractiveness of an animal. Many cattle with well-shaped horns and good heads can be spoiled by poorly shaped horns.

Feet must be kept in condition by proper trimming. Good stocks are essential in trimming feet, so the animal will not injure itself trying to get loose. One should have large planks on each side of the stocks, and low enough to fasten securely the foot which is to be trimmed. The foot should be tied with the bottom side up. Then, with the hoof nippers cut the outside rim of the hoof off, trimming more at the toe than heel. With a one-inch wood chisel pare the bottom of the hoof off until it is flat. Inside each toe use a rasp to give plenty of spread, as this makes it possible for the animal to keep its feet clean between the toes and thus avoid infection.

The hair coat of your sale cattle is like the finish on an automobile. A prospective customer is more likely to be attracted by a well kept, properly groomed animal or well-polished car, than by a dull, ragged hair coat or a faded, chipped paint job. Daily brushing

will do a lot to keep the skin healthy and the hair growing. Grooming not only creates lustre in the coat which naturally adds to the beauty, but furthermore it is a stimulus to health and vigor. A weekly washing and frequent brushing and wet curling will keep the hair and skin in a desirable condition. The animal must be kept free from lice, warbles and mange by regular spraying, dipping or dusting. During hot weather animals should be kept in the shade and in as well a ventilated barn as is available.

When the time comes for your cattle to go to the salering, one must realize that the results of months of breeding, feeding and preparation are to be appraised by the buying public. So a person should see that his consignment is presented in the most favorable manner possible.

If entered in a consignment sale the cattle should be hauled to the scene of the sale long enough in advance for them to become accustomed to the strange surroundings and to the change of water. The cattle should be taught to drink from a bucket and eat from a pan a week or so before sale time. Such details as clipping, horn dressing and hoof scraping should be done in advance of the sale so that the attendants can spend their time seeing that their cattle are well groomed and comfortable, and they themselves at liberty to discuss pedigrees, bloodlines and answer any questions that prospective buyers and visitors might ask.

There will no doubt be a stout fence around the salering and a snubbing post in the center; but by all means let us have our cattle halter-wise enough before they leave the farm. An unruly animal in a salering not only will sell at a disadvantage in most cases, but there is always a possibility that someone might be injured.

The catalogues should be checked carefully before the sale and if there are any additions or corrections, the sale manager should be notified before the sale starts.

The seller's responsibility is to see that the tattoos check with the certificates on every animal sold and that he has all the necessary health charts.

The entire purebred livestock industry is based on the integrity of men, and thus it is logical that folks like to buy from the person for whom they have the highest esteem, not just as a breeder, but as a man.

Wonder Drugs Speed Growth

Condensed from Wallaces' Farmer and Iowa Homestead

THE "wonder" drugs, streptomycin and aureomycin, may have an important role in livestock feeding.

Researchers believe the wonder drugs act as antibiotics, making favorable changes in the bacteria of the intestines. They kill unfavorable bacteria and stimulate a favorable combination of growth factors.

In tests at the Michigan agricultural experiment station, pigs made 40 per cent greater gains when given very small quantities of streptomycin along with a basic ration.

Four lots of weanling pigs weighing 26 pounds each were given an identical feed ration. This basic ration consisted of 75 per cent corn, 22 per cent solvent processed soybean oil meal and 1 per cent each of bonemeal, salt, limestone and trace minerals.

Vitamins A and B were added along with the concentrated B vitamins—niacin, pantothenic acid and riboflavin.

The lot getting the basic ration alone gained an average of .88 of a pound a day, or 37 pounds in 42 days. Those pigs getting only B-12 in addition to the basic ration gained .98 of a pound a day, or 41 pounds in 42 days.

The lot getting the basic ration plus one-half of 1 per cent of APF (animal protein factor) gained 1.43 pounds a day, or 60 pounds each in the 42 days.

The most gain was shown by pigs in the lot getting B-12 and one-half of 1 per cent of streptomycin in addition to the basic ration. This gain was 1.48 pounds per day, or 62 pounds in the 42 days.

R. W. Luecke, W. N. McMillen and Frank Thorp, Jr., set up the Michigan experiment to test for growth stimulating factors in streptomycin.

For years, farmers have found that protein feeds from some animal and fish sources give better gains than when vegetable proteins only are used in rations.

The animal protein supplements contain what has been called animal protein factor. Researchers also know that APF is made up not only of Vitamin B-12 but also of some other unknown factors.

Commercial APF supplements are produced by a fermentation process that is similar to the methods used in producing the drugs streptomycin and aureomycin, or as a by-product of drug production.

Reprinted by permission from Wallaces' Farmer and Iowa Homestead, Des Moines, Iowa, May 6, 1950

At the Hormel Institute, Austin, Minn., Dr. Lawrence Carpenter, in tests on 500 small pigs, found aureomycin caused them to snap out of intestinal troubles and gain a pound a day. Half a pound a day would be a good gain for such small pigs.

The big lift aureomycin gave these 500 pigs is in contrast with results Carpenter has obtained in testing other substances on 12,000 pigs in the last five years. Nothing else has given such good results on pigs in an unthrifty condition from enteritis or intestinal troubles.

Carpenter's tests show that streptomycin is helpful, but not as much so as aureomycin.

A. C. Groschke and R. J. Evans, poultry researchers at Michigan State College, have also found aureomycin promotes very rapid growth in baby chicks.

To further support the theory that the drug acts on the bacteria in the intestines to give this added growth, tests were made between feeding aureomycin or inoculating birds with it.

Though feeding the wonder drug nearly doubled growth in some comparisons with normal feeding practices, an injection of the drug did not stimulate growth. Evidently, it had to be eaten.

Aureomycin supplements are available thru feed manufacturers, but are not generally available direct to farmers at this time.

Sex Hormones To Fatten Turkeys

Condensed from Turkey World

Dr. R. E. Phillips
Iowa State College

THERE can be little doubt that the use of female sex hormone substances (estrogenic products) will improve the quality and market grade of your turkeys sold in 1950 if the hormone materials are used properly.

Only within the past few years has there been available to turkey growers, synthetic hormone substances which cause an increase in the amount of fat deposited subcutaneously (under the skin) in their birds regardless of the season or age that the turkeys are marketed. In the opinion of the writer, it would seem wise for every turkey grower to take advantage of this relatively new development, planning their 1950 marketing procedure accordingly.

Female sex hormone substances,

Reprinted by permission from Turkey World,
Mount Morris, Illinois, May 1950

as such, are not new. Originally they were obtained by complicated chemical extraction methods from the ovaries of animals taken to the slaughter house. It did not take the chemists long to find out how to make these substances synthetically. Diethylstilbesterol is the only commercial hormone substance permitted to be sold interstate.

This synthetic hormone product is mixed with a carrying agent and is made into small pellets, which usually have a 15 mg. stilbestrol potency. Pharmaceutical companies have made these small pellets so that they can be implanted readily under the skin in the head or upper neck region of the turkey.

If a grower decides to use the treatment, each market turkey should receive two pellets (total potency 30 mg.) four or five weeks prior to the time the birds are slaughtered. The estrogenic substance depresses the so-called sex characteristics of the male. The size of the wattle and the caruncles on the head decrease in size. The "maleness" of the tom is suppressed and there is less strutting and fighting among the birds. A review of many scientific papers on the use of hormone substances reports in the main that the stilbestrol pellets will be equally effective in the male or female, but usually only tom turkeys have been treated.

Birds treated with estrogenic substances show several striking changes. There is a slight change in body conformation. The main difference is in the appearance of the dressed carcass. With a thicker layer of fat underneath the skin, there are fewer unfinished, blue-colored carcasses when the birds are slaughtered. In many cases the dressed turkey carcasses show fewer pin-feathers than nontreated birds.

An article printed recently in Turkey World reported one, two, and three pellet (15 mg. potency) implantations of stilbestrol was used for fattening purposes. Two pellets produced the most optimum and economical results for turkeys. The use of three stilbestrol pellets did not seem to justify the expense over the use of two. One pellet was not effective for turkeys.

As with all things, it is impossible to obtain optimum results 100 percent of the time. It is the opinion of the writer that the cause of failures where female sex hormone substances have been used for fattening purposes on market turkeys may be briefly listed as follows:

1. The most common cause of failure has been that the grower does not market his birds within four or five weeks after they have been treated with the hormone materials. (Marketing the birds

four weeks after they have been hormone treated is better than waiting an additional week, in the opinion of the author.)

2. An incorrect amount of hormone materials was implanted subcutaneously.

3. Improper implantation (loss of the pellet out of the implanting instrument) at the time of treatment without the field service man knowing it.

4. Sometimes the pellets are not absorbed normally, due to one cause or another.

The amount of subcutaneous fat in the market birds is increased because stilbestrol, as well as other known female sex hormone substances, is antagonistic to the thyroid glands of the turkey and other species of animals. By depressing or minimizing the effects of the hormone secretion from the thyroid glands themselves, the birds have a decreased heart rate and a lower rate of metabolic activity. As a result, the feeds which the birds eat are changed into fat instead of being used as energy (for strutting, fighting, etc.).

It requires 14 to 16 days for the turkey grower to notice any effects of the hormone treatment in his flock. If the flock of toms is not relatively quiet within this period of time, then any birds showing normal traits, such as wanting to fight or trying to mate with other birds, should be given another 30 mg. dose of stilbestrol pellets.

The Federal Food and Drug Administration, as of this date, does not approve the mixing of hormone substances in the feed. This federal agency has, however, approved the use of synthetic hormone materials (diethylstilbestrol or stilbestrol) if they are implanted under the skin as described above.

As a summary of this report, it is the opinion of the author that the use of estrogenic substances will bring about the following results:

1. There is an increased amount of subcutaneous fat in the bird. The grade score of the dressed carcass is usually improved. The carcass has a better consumer appeal, because it is usually more colorful and attractive.

2. Contrary to what has been advertised widely, the majority of the scientific research reports indicate that there is no marked increase in body weight resulting from the hormone treatment. (The writer's own research work substantiates this.)

3. There is little change in feed efficiency—that is, there is little difference in the pounds of feed required per pound gain in body weight when compared with a non-treated bird.

4. The administration of high levels of estrogenic substances (much higher levels than that recommended) is toxic to the bird

and feed consumption is affected adversely.

5. In most cases, estrogen treated birds have fewer pinfeathers remaining on the carcass after they are picked.

6. Female sex hormone substances cause but slight improvement in the eating qualities of the carcass. The cooked turkey carcass may be slightly more moist.

7. Prolonged estrogen (more than one dose of two pellets) treatment causes the bones of the turkey (particularly the leg and wing bones) to become brittle. The bones break easily when heavy toms are suspended from shackles on the picking line in a processing plant. It is well known, of course, that birds showing broken bones are not readily accepted by the consumer.

They Farm Without A Plow

Condensed from Farm Journal

Vernon Vine

COULD you farm without a plow?

Clark Barnes and his son Fred II of New London County, Connecticut, do.

If your cows refused to eat hay, would you worry?

The Barnes family does not.

Up to last year, their cows, half of them first-calf heifers, made an average of 403 pounds of butterfat, and did it at a cost of only 35 cents a pound with concentrates selling at $5 a hundred.

The secret is ladino clover—and nothing but that—on good bottom land along the Mystic river. You don't need a plow on an all-pasture farm, the Barneses will tell you, and you don't need hay when you've got good ladino silage. Their cows even lost their taste for hay!

From 49 acres of ladino here's what Clark Barnes usually gets.

Five months' pasturage for 44 cows (28 milking, 16 young or dry.)

240 tons of silage (enough to fill two silos, one 12′ × 30′ and one 14′ × 35′).

Up to 1,200 bales of hay, depending on how much forage is left after the silos have been filled. (The hay helps carry the young and dry stock.)

But that doesn't tell all the story. The Barneses need to use a supplementary feed that runs 12% protein against the usual 16%.

Reprinted by permission from Farm Journal
Philadelphia, Pennsylvania, May 1950

That's because their ladino silage runs 17% protein. Besides, they feed only one pound of mixed feed for every seven pounds of milk. (Many dairymen feed as much as one pound of feed to every three pounds of milk.) They don't deliberately aim to skimp on grain feeding. "We feed as much grain as they'll clean up," Clark Barnes says, "but the cows would just rather eat silage. And when we tried feeding hay a couple of times, they'd take a bite or two and then turn up their noses at it."

The Barnes' grass farming program is as much the result of their location as it is the product of their farming skill.

Their farm is on the brackish Mystic river, only three miles or so from Long Island Sound. It's a hard place to make good hay, but a wonderful spot to grow pasture.

In most years, their pasture season begins about May 1. They start with a 10-acre field bounded by an electric fence.

Those 10 acres of lush spring clover carry the herd until they have cut the other 39 acres and have put up their silage, plus any hay the weather will let them cure.

From then on, the whole farm goes into pasture, until the season ends October 1, or thereabouts.

But there's more to their pasture program than simply turning the cows out on clover. A good part of it is keeping a sharp eye on the weather.

The average plot they turn their cows into is five to eight acres, but the size of the plot and the speed of rotation varies with the condition of the ladino. Early in the season, they sometimes have to go in and clip ahead of the cows. Occasionally they'll make a little hay out of the clippings; mostly they just leave them on the ground.

Later, when the cows begin to get ahead of the clover, they enlarge the plots and take the cows off sooner—maybe in four or five days.

I asked them if they had any supplemental pasture coming on when the ladino slackens off. The answer was "No!"

Any time the ladino won't carry the cows, they feed silage. They figure that they get more feed per acre that way.

They don't believe in depending on clover to do the whole job, even for non-milking stock. The young stuff gets grain every day, even when pasture is at its best. That gives them big heifers that start off as heavy milkers.

Neither do the Barneses believe in sparing the fertilizer. While they were building up their ladino, they put on 800 pounds of 0-14-14 per acre every fall. Now they put on 150 to 200 pounds of 60% muriate of potash right after mowing.

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With the number of cows they keep, they have enough manure

and bedding to cover the whole farm, and they keep the manure spreader going every day they can get out in the fields.

Operating a strictly-for-profit dairy farm, Clark Barnes has some firm ideas about his business. One is fall freshening. He's working toward that as fast as his cows will let him.

"I don't care," he says, "if I don't get much milk in May or June."

Dump trucks are a great time-saver on the Barnes place, too. They use one to haul ladino from the forage harvester to the silo filler, simply tilt the truck bed, and the chopped clover slides into the hopper.

"I can't see," says Clark Barnes, "why any farmer would have anything but a dump truck on the place."

There's still room in the Barnes' barn for a few more milking cows, and they're raising every heifer that drops. But filling those empty stanchions is only their second thought.

"The reason for raising all these heifers," says Clark Barnes, "is to have a chance to do more culling."

In other words, more milk—and cheaper milk—on clover.

Organic Matter Supply

Condensed from The Kentucky Farmer

R. Willis Stout

ORGANIC Matter—"the life of the soil," is a well put statement. Let us consider what it does for the soil. (A) It constitutes the soil's lungs enabling it to "breathe air." (B) It enables soil to hold and circulate water which is the soil's "blood." (C) It feeds and multiplies bacteria which are the "red corpuscles" of the soil.

Organic matter is number one in importance if our soil is to live and produce.

The *organic matter* of soils is the source of food and energy for millions of bacteria and fungi which flourish in its presence and are essential in a fertile soil. Just as the food we eat is "burned" (oxidized) in our bodies to provide us with materials for replacement of tissue, and energy for our work, so *organic matter* is slowly "burned" (oxidized), in the soil to provide replacement of humus

Reprinted by permission from The Kentucky Farmer, Louisville, Kentucky, January 1950

and to give readily available nitrogen and minerals to the soil microbes and crop plants. Oxygen from the air is necessary for both processes, and the more oxygen taken into the body (by breathing), or into the soil (by absorption), the more rapid the burning process goes, and the more food or *organic matter* is used up.

The more you cultivate and stir any soil, the more air and oxygen enters the pore spaces, and speeds up the oxidation or "burning up" of the *organic matter* by the soil bacteria. Cultivation and stirring of the soil are like opening the drafts and stirring the fire in a coal or wood-burning furnace. The fire burns faster, and if you want to keep it from going out you have to keep adding more and more fuel as fast as it burns. When we grow clean cultivated row crops like corn, tobacco, etc., we keep the "drafts" on our soils wide open, and *organic matter* is burned up at a very rapid rate.

When no provisions are made to replenish and keep up the *organic matter* supply in soil, when it has been "burned out," exhausted by cultivation, it might well be said that this land is lifeless. "Lungs" gone, no "blood," no "red corpuscles."

Fortunately for all of us, it is not too difficult to solve the problem of building up and maintaining adequate levels of *organic matter* in our farm soils. No one method is likely to be sufficient by itself or equally well suited to all types of farming, but it should be possible to utilize a combination of practices on every farm that will accomplish the desired end. This may require some changes in present rotation and soil management practices. *Organic matter* maintenance is part of good farming, and good farming doesn't "just happen"; it comes from "planned effort."

This brings us to the problem of *how* to keep up the *organic matter* supply in our soil.

Fortunate is the farmer who has a large annual supply of stable manure. Prosperous is the farmer who handles his stable manure with the care necessary to make it return its full value to the soil. Where crops are fed to livestock on the farm, about three quarters of the nutrients removed from the soil can be returned to the land in properly handled manure. Thus livestock manure has a two-fold value in supplying both nutrients and *organic matter*.

There is a direct relation between nitrogen and *organic matter* in the soil. As one goes up or down, so goes the other. Nitrogen is very necessary to increase and sustain the soil bacteria whose action on organic materials, such as roots, stems, stalks, straws, and animal matter, decompose them to a state of usefulness in the soil. This state, where the material loses

its identity as a root, leaf, etc., and becomes a dark coloring in the soil, is known as humus.

In planning to maintain the *organic matter* supply it is important that provisions be made for an adequate nitrogen supply, so as to gain full benefits from the organic materials. For this reason mixing superphosphate with the stable manure either in the trench, in the stock pen, or in the spreader, is a very profitable practice. Fresh stable manure contains a large amount of nitrogen, which comes principally from the urine. This nitrogen is very volatile and evaporates rapidly in the form of ammonia. Mixing phosphate with the manure locks up the nitrogen in a non-volatile form and stops its evaporation. In handling manure that has been treated with phosphate, the absence of ammonia odor is readily noticeable.

So we might say that an ideal source of *organic matter* supply is phosphated stable manure, spread on the land directly, from the trench or cattle pens. In this the livestock farmer has a little advantage over the others, but he also often needs to make use of additional methods.

The cash-crop farmer who markets his crop direct, and keeps little or no livestock has to depend on sources other than manure for his soil's *organic matter* supply. Thus it is that legume crops and sod crops in a rotation are most important for the contribution they make to *organic matter* supplies and the improvement of soil structure.

Experiments have shown that well fertilized grass and clover sods, alfalfa-grass sods, sweet clover, or a crimson clover and vetch combination, will supply as much *organic matter* as a liberal application of manure. The legumes will furnish their own supply of nitrogen taken from the air, provided the seed has been properly inoculated before sowing.

When small grain crops such as rye, wheat, or winter oats are used for *organic matter* supply they can be made even more effective by liberal fertilization at the time of planting. This increases both top and root growth, so that a larger total amount of vegetable matter is added to the soil. In this manner double use can be obtained from the fertilizer applied. For not only does it increase the soil's supply of active *organic matter,* but it also serves to introduce nitrogen, phosphate and potash into the soil through an organic medium, thus building up reserves of available plant foods for crops to follow.

The secret of effectiveness in the use of *organic matter* crops is that the whole crop, tops, roots, and all must be incorporated into the soil. Grass roots and legume roots (especially sweet clover) will furnish many tons of organic material, but to do an effective job and

meet the demand, the tops must be used too. Don't cheat—plow under the whole crop.

Corn stalks left on the ground and crop residues from the combine, when disced in or plowed under are fair sources of *organic matter*. Crop residues alone, however, are not enough to maintain the supply needed by cultivated fields. They only replace in part the humus burned out by the crop just harvested. These residues are too low in nitrogen to decompose rapidly. The bacteria working to break them down will have to pull nitrogen from the soil. For this reason many farmers find it profitable to apply nitrogen fertilizers, such as ammonium nitrate, to the residues before working them into the land.

Experience has shown that a combination of methods for maintaining *organic matter* in cultivated soils is likely to prove most effective. Soil type, drainage, intensity of cultivation all vary, and the problem is different on every farm.

Organic matter alone, however, seldom keeps crop yields at a high level, for the sources of supply cannot return to the soil the mineral elements as fast as they are removed by big crop production. It is, on the other hand, a most essential basis for making it possible to efficiently produce big yields through the use of commercial fertilizer.

What is needed in the final analysis is a *balanced system of soil management*, in which provision is made for the return of *both organic matter and fertility* in proportion to the annual removal from the soil.

Any system of agriculture that tends to permanently lower the *organic matter* and fertility of the soil below a point where successful crops can be produced, must lead without fail to bankrupt land, bankrupt farmers, and in the future, danger to our children's nation as a world power.

Reports On Swine Experiments

Condensed from Hog Breeder

GROWING-FATTENING pigs weighing 40 to 50 pounds initially and self-fed to 200 pounds required 6% more concentrates per 100 pound of grain on **bromegrass** than on **alfalfa** pasture. Those on alfalfa required 33% less protein supplement and 13% less minerals per unit of gain and reached the final weight one week earlier. An **alfalfa-bromegrass** mixture was fully equal to

Reprinted by permission from Hog Breeder, Chicago, Illinois, March 1950

alfalfa pasture for self-fed pigs.

On similar pastures, the rates of gain between groups of growing-fattening pigs did not differ significantly when the following **supplemental mixtures** were self-fed free-choice with shelled corn and a mineral mixture (40% limestone, 40% steamed bone meal and 20% iodized salt): (a) 1 tankage or meat and bone scraps and 1 expeller soybean meal; (b) 2 expeller soybean meal and 1 alfalfa meal; (c) 1 expeller soybean meal and 2 ground oats; (d) 1 expeller soybean meal and dried corn distillers' solubles; (e) 1 meat and bone scraps and 1 dried corn distillers' solubles; and (f) the latter plus 1 soybean meal. When expeller soybean meal was self-fed free-choice, the pigs ate almost twice as much as those hand-fed only enough soybean meal ($\frac{1}{2}$ lb. per head daily) to balance the protein content of the ration without significantly affecting the rate or efficiency of gain. Evidence to date indicates that properly processed solvent soybean meal is as palatable, if not more so, than expeller soybean meal when each is self-fed free-choice with corn and minerals.

Pigs self-fed **pelletted supplement** free-choice on pasture ate 8.4 pounds more supplement and 17 pounds less shelled corn per 100 pounds of gain than pigs fed meal supplement.

Exposing self-fed pigs on alfalfa-bromegrass pasture to **night lights** (2-150 Watt reflector bulbs) for two intervals of one hour each (10–11 p. m. and 3–4 a. m.) had no significant effect on performance in comparison to controls fed the same ration.

An average of three tests showed that pigs **creep-fed** a simple ration of shelled yellow corn and supplement (2 tankage, 1 soybean meal) made 12% faster daily gains than those not creep-fed when the sows were fed a "poor ration" of ear corn (full-fed twice daily) and minerals on rye pasture. The sows and litters in creep-fed lot required 20% less feed per unit of gain than those in the no-creep lot.

In two comparisons there was no significant advantage in **creep-feeding pigs** when the sows and litters had access to a "good ration"—shelled corn and supplement—self-fed free-choice on rye pasture (spring test) or bromegrass-bluegrass pasture (fall test). Nevertheless, creep-feeding of pigs appears to be justified under the following conditions: (1) when large numbers of sows and litters are running together, increasing hazards to the pigs; (2) when sows are hand-fed in groups; and (3) when sows are fed limited rations which would prevent the pigs from having access to an adequate amount of supplementary feeds.

Oil Is Cheaper Than Repairs

Condensed from American Agriculturist

Paul R. Hoff

ALMOST EVERY one who operates a tractor realizes the need of adequate lubrication at regular intervals. Field machinery requires the same careful lubrication that tractors and automobiles receive. Adequate lubrication is always a good investment because the length of life and freedom from trouble of any farm implement depends largely upon the lubrication it receives.

Most modern power machinery is fitted with pressure grease fittings for lubrication with a pressure gun. Pressure grease lubrication is convenient and positive if a few simple rules are followed. The rules are:

1. Clean each fitting before lubricating. Don't push dirt from the fitting into the bearing along with the grease.

2. Force new grease into the bearing until the old grease is forced out and the bearing is filled with fresh grease. With pressure gun lubrication it is possible to clean the bearing each time it is lubricated by forcing fresh grease in until all of the old grease is out and new grease appears at the edge of the bearing.

3. Remove the excess grease from the edge of the bearing. Grease that is allowed to remain may collect dirt or grit that works into the bearing.

4. Keep the pressure gun grease clean. The purpose of lubrication is to fill the bearings with clean, fresh lubricant. This can be done only if the containers are kept covered to exclude dust and dirt and if the grease gun is filled under clean conditions.

5. Be regular. Most instruction books specify grease gun lubrication at 5 to 10 hour-of-operation intervals.

Older, slow-moving implements that were built to be pulled by horses and which have oil holes or grease cups for lubrication may not have enough lubrication when they are operated at higher speeds behind a tractor. The lubrication of these implements can be improved by replacing the oil holes or grease cups with pressure fittings.

Four different oils and greases meet the lubrication requirements on nearly all farm implements. The various grades (viscosities) are designated by SAE (Society

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Ithaca, New York, February 19, 1949

of Automotive Engineers) numbers. Lower numbers mean lighter grades; SAE 10 oil is lighter than SAE 30 oil, and SAE 90 gear oil is lighter than SAE 140 gear oil. Machines operated all year may require lighter oil or grease for winter than for summer.

1. Oil. Many older implements depend upon oil holes or oil cups which often require cleaning or opening each time for the frequent oiling that is necessary for adequate lubrication. SAE 30 or 40 motor oil is recommended for warm weather and a lighter grade for winter operation. Badly worn bearings may need heavier oil that cannot be thrown out of the bearings as quickly. Lubrication by oiling each 5 hours of operation or oftener.

2. Cup grease, designed for grease cups, is stiffer than chassis lubricant. Turn down the grease cup enough to force fresh grease into the bearing each 5 to 10 hours of operation.

3. Pressure gun or "chassis lubricant" is made for pressure gun lubrication. Chassis lubricant of a "sticky" consistency clings to bearing surfaces better than others. It is an all weather lubricant.

4. Gear oil for enclosed gear cases. SAE 90 to 140 is usually recommended for enclosed gear cases on farm implements. The manufacturer's instructions should be followed. If the implement is operated in cold weather, the heavy summer weight oil should be replaced with lighter gear oil. Otherwise, change the gear oil once each year.

In addition to the above lubricants commonly used on farm implements, lubricants made especially for exposed gears and chains can be purchased. In addition to furnishing lubrication, they prevent damage to the wearing surfaces by dirt or other foreign material. In general the lubrication of exposed gears and chains is difficult, and less wear may occur if they are run dry. If drive chains are lubricated, they should be removed occasionally, washed in kerosene, dipped in light motor oil and allowed to drain before they are replaced.

Keep Cool in the Hay Mow

Condensed from The Michigan Farmer

John W. Fitzgerald

HOT hay is no laughing matter. Farmers know they can't afford to take chances with this hazard. Heating leads to spontaneous combustion and the possibility of a tragic barn fire.

The wisest step is to make sure the hay crop is dry enough to store. Even then it's best to make sure the hay is not heating in the mow.

When hay is stored with much over 20 per cent moisture content, danger of heating is present. Damp hay, even in small amounts, can be serious and cause heating in various locations through the hay.

The 2 safety pointers for avoiding trouble with the hay crop are proper storing and careful checking. Both of these jobs can be done with simple tests that anyone can perform.

Guesswork on whether the hay is ready to store can be eliminated by the test devised by Dr. S. T. Dexter, farm crops research scientist at Michigan State College. Simple materials and a few seconds' time are all that are needed.

To work the test, get a uniform sample that represents the average condition of the hay. Bend or twist the sample to break the stems and cut a portion from the center of the sample long enough to fit in a round pasteboard quart ice cream container. This waxed container is important since glass or metal do not work well.

Put the hay sample in the container and add a teaspoonful of ammonium chloride salt. This salt is obtainable at drug stores. Put the cover on the box and shake the container vigorously about 100 times.

When you open the container, shake the salt into the cover. If the salt is damp and clumped together, the hay is still too damp to store and needs more curing. But if the salt is still dry and in single grains as it was before shaking with the hay sample, it's safe to store the hay under average mow conditions.

Just getting the hay in the mow isn't the end of the job. It takes some careful watching to make sure that pockets of damp hay have not crept into the mowing operation. It often takes several weeks for hay to heat to the burning point. Gas develops when the heat reaches a certain degree. If

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Detroit, Michigan, June 4, 1949

the mow of hay is opened or the air supply is abundant, the hay may burst into flames.

Checking should be done regularly for 2 months after hay is put in the mow. This can be done with a hay probe which includes a thermometer. There is a commercially made probe on the market with the thermometer built into the instrument head. It is very handy and easy to use. Or one can be made from 10 feet of one-half inch electrical conduit with an oak or ash point. This point makes it easier to drive the conduit into the hay. Six one-quarter inch holes should be punched in the conduit just above the point. A dairy thermometer on a string can be lowered into the hay through the conduit.

The probe with the thermometer inside is driven in the hay and left 10 to 15 minutes. Then the thermometer is drawn up from the conduit and read immediately.

Here are the danger signals: if the thermometer reads 140 degrees Fahrenheit, the hay should be checked several times a day. At 160 degrees, check every hour. Get assistance from the fire department if it should rise any higher than 180 degrees.

Remember: don't work alone in the mow if the temperature is excessively high. Have adequate fire fighting personnel and equipment on hand if the hay is to be moved and have someone supervise who understands the correct removal of heated hay. It's not a job for amateurs.

Haying is a job that takes a lot of a farmer's time. But time is the only thing it should take. A tragic barn fire can be avoided by careful checking of the haying job both BEFORE and AFTER.

Reduce Costs To Make Money

Condensed from American Poultry Journal

G. T. Klein
Massachusetts State University

BROILER production costs vary with different individuals, and while most producers make profits, there are places where savings can be made. Let's see how the costs run.

In February, 1950, it cost a group of Massachusetts growers 21.7 cents a pound, cash outlay, to grow 1,648,427 broilers. Feed was the largest item, costing 13.7 cents a pound or 63.29% of the cash outlay. But, the feed bill varied from farm to farm. These were differences which meant money in the pockets of the low operators.

Chicks at an average price of 15 cents each ran up 20.27% of the cash cost, while hired labor was 7.26%. Of course, there were some farms on the list that hired no labor. Wages for the owners were not estimated or figured in. John F. W. Schulze, of Massachusetts Department of Agricultural Economics, says it's next to impossible to figure the owner's time. There were miscellaneous expenses which totaled 9.18%. These items included fuel, litter, medicine, vaccine, and the like.

Here are other figures which came out of the Schulze study of the 34 farms.

Average price per pound of broiler	22.8¢
Feed cost per pound of broiler	13.7¢
Cash expense per pound of broiler	21.7¢
Cash receipts per broiler	78¢
Feed cost per bird	47¢
Cash expense per bird	74¢
Price of broiler ration per 100 lbs.	$4.18
Average weight of birds	3.43 lbs.
Average mortality—approximately	7%
Average rate of hired labor	$2483.00 per year

Since the feed bill is the largest percentage of the cost by a wide margin, it is the first place to look for a place to make savings.

Some of the Massachusetts operations show a pound of broiler for 3 lbs. of feed at about 11 weeks. Others require 3.6 lbs. to the same age. One might say offhand that perhaps the low figure is high efficiency feed—the high figure, the regular kind. But that is not the case. There's hardly a broiler farm in New England using other than high efficiency or high energy rations.

The differences are in the feed that is wasted by the birds in billing it out of the hopper and the feed wasted by rats and mice. There are also differences in feed efficiency of various strains and crosses as well as mortality differences.

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In general, the automatic feeders are kind to the feed bills as well as to labor. Automatics, properly adjusted, keep birds eating out of the bottom of the trough with practically no feed billed out. If there is a difference in growth between a good setup for hand feeding and the automatics, it is slight. Make no mistake, however. If I were putting in a new broiler operation of size, it would certainly include automatic feeding.

Tracht and Roche, Palmer, Massachusetts, who have raised more broilers than any other Massachusetts growers, use these figures for feeder standards for each 1000 chicks. They feel these allowances give best growth on the least feed:

16 chick size, 30 in. long, cost 35c each; 16 intermediate size, 4 ft. long, cost 75 cents each: 16 large size, 5 ft. long, cost $1.30 each.

Automatics are used in some of the houses, and hand feeding in others. With the automatics, the workers go around with oil cans and are mechanics after a fashion. They keep the motors going and watch for feed jams. But the hand feeders on these farms have an incentive to be saving because they get a bonus on an economically produced lot. It's to their advantage not to have feed billed over the sides of the feeders, because a 3.2 feed efficiency makes greater net return for the owner and a bonus for the worker.

There's quite a knack to filling hoppers hurriedly and without waste. If the feed comes in by carrier, it's one thing. If it is carried in bags, emptied in pails, and scooped out into the hoppers, that is something different. It can make a slight difference in the time required for feeding if the hoppers are lined up end to end or lined up parallel to one another. The best plan to use is almost always an individual problem.

A 7% mortality is a place where additional savings can be made. It's a good 2 to 4% higher than is necessary. It's high because Newcastle hit several flocks at a young age running mortality sky high.

I think we have a great chance for lowering Newcastle mortality with the new live virus nose drops vaccine recently announced by Dr. Stephen B. Hitchner, formerly of Virginia Polytechnic now of the University of Massachusetts. It will be particularly helpful where there is an active outbreak of Newcastle in the community that is getting into the young birds. There are times of the year and in certain communities where a broiler grower need not go to the expense of Newcastle vaccination.

I think one could say without hesitation that coccidiosis need no longer be a broiler growing prob-

lem if he feeds one of the sulfa compounds.

There is money to be saved by re-using litter to some extent. Perhaps if the house is thoroughly cleaned, painted with carbolineum and new litter is put in for the January brood, it will then go through a year's use without another thorough cleaning. That's the way it appears from here, although there is no objection to additional cleaning and renewal of litter except the labor and expense. Sometimes ammonia builds up in old litter to where there is considerable eye trouble. When that's the case, it ought to be discarded.

The heat for brooding isn't a big item, and yet there are differences in fuel costs which are worth considering. It's a penny here and a part of a cent there which determine the profit on a brood of broilers. For quality of birds, comfort of the workers, low mortality, fuel and labor economy, it's hard to find a better brooding system for broilers than hot water pipes above the floor.

After all possible savings have been made by cutting production costs, there may at times be little profit left. It often happens that a better marketing program means more profit than all the other economies. I've seen a bunch of broilers stand a grower a loss at the customary 12 week selling age. But these same birds capetted and held another 4 weeks brought an attractive profit. There are times when the sex hormone pellets may be used to good advantage.

Broiler consumption is at a high level and should hold. Still we probably have more productive capacity than can be marketed at a profit to all producers. It appears that the producer who can keep his costs low will be the one who will stay in business.

Tropical Peasant Farming

Condensed from World Crops

G. B. Masefield
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ONLY since the beginning of the present century has the sustained attention of scientists been given to the improvement of tropical peasant agriculture. It is therefore not surprising that we still lack much of the essential information on which improvement must be based. In estimating the possibilities a balance must be struck between proved methods which could raise production if they were put into practice, and the problems on which advice, founded on adequate experience, cannot yet be given.

Data are still very deficient concerning environmental factors; elementary meteorological data, such as rainfall records, are still only available from recording stations sparsely scattered over the tropics, and the development of new areas, such as the East African groundnuts scheme, usually brings to light local variations in rainfall which are of profound importance to the practical farmer. The same applies to the distribution of soil types; so far the devoted work of a few soil surveyors has only sketched in the broadest outlines. The recent realisation that the outstanding characteristic of most tropical soils is their poverty indeed represents a great advance, but details need to be filled in everywhere. Fuller knowledge of the ecological background is equally important. The annual burning of grassland is an almost universal tradition in the tropics, which has been roundly condemned under some conditions and grudgingly accepted under others, but we still lack essential information on the effect of fire on the growth of tropical grasses and on the composition of the grassland flora.

The same ignorance extends to many aspects of agronomy and provides continual surprises even for trained agriculturists. When soya beans were introduced into cultivation in Uganda in 1942 it was expected that this leguminous crop (even though it was not inoculated) could play a useful part in maintaining soil fertility; and it was with surprise that a shoal of complaints were received from cultivators about the bad effect of soya beans on the succeeding crop. Yet this is in

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17 Stratford Place, London, England, December 1949

accordance with recent American conclusions that this crop, even when well nodulated, considerably exhausts the soil. Very little is known of the relative effects of the other numerous tropical pulses on fertility, or of their exact role when grown with cereals in the very common native practice of mixed cropping.

Data are equally scarce about tropical pasture grasses, and particularly their nutritive value. There is some evidence to support the suggestion that the hot, drying winds of tropical dry seasons perform a natural grass-drying operation upon certain grasses, conserving their protein content at a valuable level as they stand; but too few analyses have been done to enable a general check on such an important point. Investigational work on such subjects as plant breeding and disease resistance has been largely confined to a few tropical crops of prime commercial importance, and in the case of food crops, such as the millets and root crops, our knowledge is rudimentary.

Valuable information of two kinds concerning existing agricultural practice can be obtained from farm and village surveys. One is purely agronomic and concerns such points as the acreage of each crop grown per cultivator, the usual planting date, the incidence of pests and diseases, and the yield per acre. The other is economic and concerned with labour demands, cost of production, and income derived from each crop. A few very useful surveys of this kind have been conducted in some tropical countries; but they are required on a far greater scale. A study of variations in existing farm practice is an essential preliminary to any plans for its improvement. It is also true that the efficiency of farm management cannot be correctly assessed, nor comparisons made between different farming systems, unless some of the farmers keep accounts in at least a rudimentary form. This prospect is still a long way off for most tropical peasants, but some governments have realised the importance of encouraging book-keeping as farmers become sufficiently educated.

In some territories efforts have been made to determine the ideal size of a small-holding and the rate of stocking it needed to support a peasant family. Some have not produced useful results through failure to distinguish between two separate problems. Evidence is usually sought on (*a*) the amount of produce which the farmer can obtain from a unit area of land or number of stock, and (*b*) the area of land and number of stock he can manage with his family labour or such other help as he can command. Unfortunately each of these figures depends on the other; for

example, a man with more land than he can manage gets low yields of crops, and it is accordingly impossible to measure both figures in the same experiment; one must be held constant while the other is determined for that particular level. Such investigations are, indeed, essential to sound agricultural planning, but they are extremely complex to carry out.

It must be borne in mind that under poor environmental conditions, improved strains of crops and livestock may not be able to fulfil their genetic potential. Peasant farmers may find that a dairy cow of superior strain yields no more milk than does the local scrub breed, if it is only fed on the same rations as the latter. Failure to give it sufficient food for its productive power may be due simply to ignorance, or to the fact that the current farming system does not provide enough feed to meet the extra demands. Both these effects must therefore be taken into account when the superior animal is introduced.

Similar cases arise with crops; hybrid maize, which is capable of giving very high yields, may show little improvement over local strains if it is planted on worn-out land or without manuring. The provision of such first or second cross types of seed also raises another difficulty in primitive countries; for its production demands a considerable commercial organisation and and will often be impossible to arrange in a country where no seedsmen exist and where the initial demand would be only for very small quantities.

There are other factors which form a background to planning for agricultural improvement. One is the psychology of the farming community. Most natives of the tropics set a much higher value on leisure than do Europeans, and hence the extra produce to be obtained from an extra hour of work must be distinctly higher, to provide an incentive to this work. Again, many peasant cultivators have become habituated to slack seasons between crops; and however much the introduction of mixed farming may be shown to benefit them will be reluctant to keep animals because of the regular work involved all the year round.

Moreover, many natives of the tropics are incapable of exerting the same physical strength as a European in his own country. This has agricultural implications. If some men as less strong than others, implements must be made to fit their strength or they will not be able to give of their best. Some of the two-wheeled horticultural tractors tax the strength of a British worker to drive all day especially on small plots with frequent turns, and hence they

are far from suitable for the tropical peasant.

Finally educational standards are inseparably connected with agricultural improvement. A man cannot calculate the appropriate quantity of manure to put on a plot of a fraction of an acre if he knows no arithmetic; nor can he mix an insecticide unless he can read the 'instruction on the tin.' Without education he cannot improve his knowledge by reading agricultural pamphlets or journals. Women, who do the bulk of the agricultural work in many tropical countries, are even more illiterate than men.

A factor of another kind which can limit agricultural improvement is the land tenure system. Lord, writing of the improvement of rice yields in Ceylon by weeding, says "If the cultivator received for his own use all the increase, weeding is profitable and may be very profitable but where half the increase goes to the landlord, the economic incentive for improvement may be insufficient." The mechanisation of agriculture may be rendered almost impossible by the fragmentation of holdings into tiny patches, as has been found in Cyprus and elsewhere.

Sometimes the factors which make agricultural improvement impracticable are beyond the control of agriculture itself. One of the most frequent is poorness of communications. In 1944 a record Uganda maize crop, grown for export to Kenya, proved beyond the capacity of the railway to carry, and much of the surplus was perforce left to rot. On a much bigger scale, groundnuts for export accumulated in Northern Nigeria until in 1948 there were 330,000 tons, or more than a whole year's crop, in stock because the transport system could not move them to the coast. Of what use is the improvement of crop yields by technical skill when the resultant produce is unable to reach its market?

Another such limiting factor is water supplies. In Africa there are areas of empty land where the rainfall is sufficient for crop growth but settlement cannot be made because there is no permanent source of drinking water for man and beast.

Industrialisation, too, may be of the greatest importance to agriculture. There is little hope that in our time local factories will supply the tropical farmer with tractors, agricultural implements, and spare parts as readily and as cheaply as the European or American farmer gets them. But each new factory opened in the tropics to make hoes, sacks, or other agricultural essentials means that these can be obtained sooner and with more certainty, even if not always more cheaply. The use of artificial fertilisers in

the tropics has been severely limited by their high price, but new possibilities, which may revolutionise local agriculture, will be opened up by hydroelectric schemes for Rhodesia and Uganda, which can provide power for the local manufacture of sulphate of ammonia and the discovery of large phosphate deposits in East Africa is also full of significance for the future.

Against a background in which so many factors play their part, experimentation must often be carried out on a village scale, for not all questions can be answered by simple investigations on an experimental farm. This is particularly the case where both technical and economic factors are interlocked, as in the problem of mechanisation. For example, the acreage of peasant crops which will economically support a given implement, and which such an implement is capable of serving efficiently, can only be finally determined by village trials, although the initial data on which such trials are designed will generally be gathered on an experimental farm.

In peasant agriculture it will rarely be economic for a single farmer, even if he has the necessary capital or it can be made available to him, to pay for cultivating machinery, modern methods of pest control, or the grading of his produce. Agricultural improvement therefore demands provision of group services. These may take different forms. Co-operative societies have achieved considerable local success. Implements may be provided by contractors, who hire them out to the peasant. In recent small-scale trials in Uganda, the Government has itself been the contractor and hired cultivating machinery to peasants. Special schemes may be designed to suit local conditions. In the Gezira area of the Anglo-Egyptian Sudan the triple partner ship between the Government, the cultivators, and the Sudan Plantations Syndicate has achieved conspicuous success with the cultivation of irrigated cotton and other crops. The East African groundnuts scheme represents another approach to the problem, which takes us beyond the bounds of peasant farming, though its ultimate ideal is the "distant goal of transferring the control of the undertaking to the people themselves, possibly on some co-operative basis."

A different form of group farming was envisaged by the West African Oilseeds Mission, who projected "tractor units" of 600 acres, each of which would be worked by 20 families having user rights to 20 acres each out of the 400 to be cropped annually, with each farmer contributing to the costs of mechanical tillage out of the proceeds of his crop sales.

Another interesting scheme is the settlements under "corridor cultivation" in the Belgian Congo, where the peasants work contiguous strips on which the same succession of crops is cultivated, making group services very easy to provide.

While grouping of farms may be desirable, or even essential, it has to be remembered that, once the minimum size of unit has been passed at which it is economic to operate modern machinery whether for cultivation or processing of crops, great size does not in itself necessarily confer agricultural advantage. Too large an organization may even introduce dangers of its own such as a top-heavy supervisory staff or a lack of technical control over outlying sectors.

The possibility of getting improved methods put into practice by peasants depends to a great extent on the extension methods used. In this field a great deal of research remains to be accomplished. No detailed comparison has, for instance, been made between the relative efficiency of "demonstrators," who have achieved such striking results among African farmers in Southern Rhodesia, and "instructors," who are the normal extension agents in most other British colonies. Modern techniques of publicity such as the Press, pamphlets, broadcasting, posters, films, film strips and other visual aids are only just beginning to be critically studied from this angle in tropical regions. Not only must the relative number of improvements effected through each medium be investigated, but also the relative cost of attaining a desired improvement by each medium. In this respect, research in tropical territories lags far behind the attention which has been given to the subject in the United States.

What then, in brief, are the prospects of improving peasant agriculture against such a background? It is clear that the most important objective must be not the introduction of any single technical method, for different conditions will demand many different methods, so much as a revolution in the peasant's conception of farming which will make him receptive to improved methods. This can be clearly illustrated by reference to the problem of the maintenance of soil fertility.

Over most of the tropics, the traditional farming system is one of shifting cultivation, by which a sparse population maintained itself in ecological balance with its environment, while the cultivated land was able to regain its fertility under long periods of natural regeneration of the vegetation. With the rapid increase in human and livestock populations

in modern times, the system has broken down. Attempts at maintaining soil fertility by the use of manures or green manuring have proved in many tropical areas to be only palliatives, incapable of arresting the slow decline in fertility of continuously cultivated land.

The work of Dr. W. S. Martin in Uganda, which showed that by deliberate planting of suitable grasses as a restorative crop the period of regeneration could be greatly shortened, marks a new era in the scientific approach to these problems but does not provide a universal solution. While it appears admirably suited to areas of well-distributed rainfall and heavy soils, it is by no means certain that it would confer the same benefits in, say, the Rhodesias where owing to lack of rain grass makes practically no growth for half the year. On the light soils of Southern Rhodesia, there is evidence that the application of farmyard manure is a more effective method and will, in fact, maintain fertility over a long period of continuous cropping.

What is wanted, therefore, is that the peasant should become aware of the necessity for following advice on cultivation matters based on suitable local experiments. This is equally important also in relation to soil conservation measures which are indispensable in tropical and sub-tropical countries, but whose details demand an infinite local variation.

A similar change of heart is needed to make the peasant view grass as an important crop. Whether for grazing, fodder, soil regeneration, or the prevention of erosion, grass must receive the same degree of attention as is given to other main crops. It is, however, not surprising that the primitive African peasant has not yet reached this stage, since even the British farmer is only just beginning to take this view of grass, which is the most important crop of his country.

Inevitably, with the increasing development of the tropics, the peasant must make the change from extensive to intensive farming. Extension of the acreage cultivated by reclamation, irrigation, drainage, and the provision of water supplies is still possible over wide areas, but increase in yields per acre is the central problem which will become ever more urgent with increasing population. Apart from ranching practice in under-populated regions, intensive farming for a high output per acre is the secret of increased farm incomes and a rising standard of life in all agricultural countries. This change of outlook is an essential pre-requisite for the adoption of manuring, efficient methods of pest control, and more scientific methods of culti-

vation. It is also necessary if crop-farming peasants are to be induced to introduce livestock and thereby adopt mixed farming, with its output of higher-priced animal products, improvement in the farmers' diet, and the opportunity which it gives to increase fertility by grazing the cattle on leys and the making of farmyard manure.

Finally, there can only be limited progress until the primitive hoe is in large part replaced by implements which give a greater return for the same amount of labour. But though the hoe may be considered a dying implement, it will not be dead for a long time yet; and in regions of high fertility where cultivation is horticultural rather than agricultural it may show a surprising economic vitality.

The Value of the Rare Elements

Condensed from Commercial Fertilizer

A. A. Nikitin

THE purpose of this paper is to make more readily available the information secured by various investigators at State and Federal Agricultural Experiment Stations, in their investigations on plant nutrition.

The elements manganese, iron, zinc, and copper have sometimes been called the minor elements because they are required by plants only in trace amounts. This does not mean that they are not as vital to the well-being of plants as the other elements such as potassium, nitrogen, phosphorus, magnesium and calcium.

These minor elements occur in sufficient quantities in most soils; however, if any one element is deficient in the soil, an abundance of other elements will not make up for its lack. When we refer to deficiencies of these elements it is not generally a question of absolute deficiency in total quantity of the element in the soil, but rather a deficiency arising from insufficient availability.

The physical and chemical properties of soils have a great deal to do with the availability to plants of various elements.

The first factors in the soil affecting availability of the elements are as follows:

1) Character of the soil reaction, i.e. the pH value of soil.

2) Amount of colloidal material present in the soil.

3) Organic materials consisting of plant and animal residues, known as humus.

Soil acidity is not derived from

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such commonly known inorganic acids as sulfate, phosphate and borate, but rather from a process of prolonged movement of rainwater through the soil. This comes about because the main soil acids are themselves the colloidal particles of clay. These clay acids have a tendency to lose the base elements, calcium, magnesium, potassium and sodium, that were absorbed to their surfaces. Excessive cultivation and lack of cover crops during the rainy season may increase this leaching out. If these alkaline materials wash out to too great an extent, the soil will be acid; but if the soil particles are saturated with the basic elements from liming, the soil again becomes alkaline. This replacement of one cation absorbed by a colloidal particle (A. g. soil), by another is called base-exchange capacity.

Clay soils have a higher base-exchange capacity than sandy soils, and will retain higher concentrations of the essential elements. In soils of high humus content, these essential elements will, to a large extent, be retained in a form of salts which are readily available to the plant.

Marl soils or heavily limed soils, which are of alkine reaction, tend to render the essential elements practically unavailable to plant growth.

Dr. K. C. Beeson of the U. S. Department of Agriculture's Plant, Soil, and Nutrition Laboratory, Ithaca, New York, has said, "It should be remembered that these deficiencies are more frequently associated with liming practices than any other factor."

We shall discuss chiefly the elements manganese, zinc, copper, and iron, their relationship to plant growth, and how their deficiency may be noted on some major crops.

Manganese has the name of the "green element" because it functions chiefly in the synthesis of chlorophyll, the green coloring matter of plants. A lack of manganese is most likely to be associated with calcareous or heavily limed soils. Oxidizing conditions, influenced by mineral salts as well as by the soil organisms, seriously affect the availability of manganese.

The addition of sulfur to soil helps to release manganese. Analyses have shown that although the increase in exchangeable manganese due to application of sulphur may not be marked, the increase in manganese content of plants is sufficient for improving the plant growth. The addition of organic matter to the soil has the same result.

This element, along with copper and zinc, directs the major elements, nitrogen, phosphorus and potash, to their positions for carrying out their particular functions in the plant.

Several physiological diseases,

the best known of which are "Grey Speck" of oats and "Marsh Spot" of peas, have been definitely proved to be due to a manganese deficiency.

The value of zinc as a plant nutrient, and also its toxic effects, are not new discoveries, though the extensive use of zinc salts for nutrient purposes on crops in the field dates from only a few years back.

Zinc has become established as both a plant nutrient and a valuable fertilizer and spray material.

The role of zinc within the plant is not yet understood, but it may be postulated that zinc is necessary for chlorophyll formation and growth.

Zinc deficiency occurs on heavy clays and clay loams, light sands in which the colloidal material is organic in nature, muck soils, soils containing high calcium carbonate, and clay soils of low exchange-capacity, (i.e. the clays in which the base ions are not readily exchangeable.)

The availability of zinc in the soil varies and depends greatly upon the pH, being lower as the pH rises, the critical range being between pH 5.5 and 6.5.

The deficiency of zinc on many acid soils appears to be due to the cropping out of naturally available zinc or that accumulated by native plants.

In some acid soils zinc availability may be reduced through the retention of the zinc by organic compounds in the soil.

It has been found that trees pick up considerably more zinc and copper when magnesium deficiency is eliminated.

Plants apparently vary greatly in their zinc requirements, and also in their ability to obtain zinc from a given soil.

Zinc, the "vitalizing element" has been found to be effective in treating some physiological diseases, much as "mottle leaf" or "Frenching" citrus, "little leaf" of peaches, "bronzing" of Tung trees, and pecan "rosette."

The function of copper as a fungicide for the protection of plants against fungous diseases has been known for over 60 years; however it has only recently been proved that copper also has a nutritional value in plant growth.

Copper is a normal constituent of a large number of plants. The fact that seeds are high in copper suggests that this element is especially important in the case of plants grown for seed.

Available evidence indicates that copper deficiency in vegetables is most commonly observed in those grown on dark colored soils, which contain a high percentage of organic matter. Most mineral soils except possibly some that are very sandy and leachable, or those which contain an excess of lime, contain a sufficient amount of

copper to support normal crops of vegetables.

Copper, like zinc and manganese, seems to act as a catalyst for some of the major elements. It is necessary for vigor and fruit production in plants.

The existence of a copper-nitrogen balance has been noted on several crops and this effect on nitrogen metabolism has an important bearing on nitrogen fertilization in copper-deficient areas. Copper has been observed to protect against toxic effects of certain proteins formed as a result of excessive nitrogen fertilization.

The results of H. C. Harris of the Florida Agricultural Experiment Station showed that, among grain crops, oats appear to be particularly sensitive to copper deficiency. Even a very small amount of soluble copper salt applied to the soil has a beneficial effect on plant growth and yield.

Dr. Harris also found that the basic fertilizer treatment, especially in conjunction with copper, appeared to have an effect on cold resistance of oats.

A deficiency of available iron results in a chlorosis of plant foliage. Like those of zinc, manganese and copper, iron deficiency usually associates itself with highly calcareous or overlimed soils. Another basis for iron deficiency has been suggested—that, under alkaline conditions, iron already in the plant is thrown out of solution, principally in or near the nodes (joints), so that it fails to reach the leaves where it is needed.

In correcting deficiencies of the rarer elements, consideration must be given to the reasons for the deficiency, and a suitable method of treatment chosen. The composition of the soil, its reaction, and the relationship between minor and major elements, must be seriously considered.

Overlimed or calcareous soils are likely to "tie up" the minor elements in insoluble alkaline salts, making them unavailable to plants, even though there may be a sufficient quantity of the actual elements present in the soil. In such cases, small amounts of the required minor elements should be added at intervals during the growing season so that a supply of these elements will be readily available to the plants.

On clay soils the required amount of fertilizer materials may be added before planting of the crops.

Soil amendments may be used to improve the physical or chemical character of the soil and to aid in the correction of deficiencies. Lime is used to neutralize excessive acidity and to loosen clay soils. A certain amount of lime also helps to reduce the leaching of mineral salts. Overlimed or alkaline soils may be neutralized by treatment with sulphur or acid-forming fertilizers such as sulphates, which

tend to render the mineral salts more available for plant growth.

The method of applying the essential elements in the correction of soil deficiencies may be divided into two classes.

1. Treatment of the soil.
2. Treatment of the plant.

The soil treatment may be made by surface application of fertilizer broadcast or as a side dressing. For much application the soluble salts of the essential elements may be applied alone or in combination with other commercial fertilizers. Use of fertilizers containing potassium and sodium in large amounts must be carefully considered, since these salts may seriously affect the solubility of the rarer elements.

Plant treatment may be made by either spraying or dusting plants with neutralized mixtures of the elements. Latest progress has made available the elements copper, zinc and manganese in neutral form, suitable for direct application to plants without treatment with lime.

Plant treatment has considerable advantages over soil treatment, since its action is much more rapid, due to the large leaf area which is in contact with the fertilizer material. It has been proved that plants readily absorb the mineral elements thus applied, in quantities sufficient for their growth.

The rates of application of the different elements will depend upon the type of soil, method of application, and the extent of the deficiency, as well as upon the crop on which they are used.

The average chemical composition of a large number of plants shows the following amounts of the rarer essential elements to be present:

Manganese 101 parts per million
Iron 251 parts per million
Zinc 41 parts per million
Copper 11 parts per million.

From the above it is evident that large amounts of the elements may be detrimental, just as deficient amounts are.

In plant treatments, combination sprays seem to perform better than single sprays, and even though plants may not show visible signs of needing all elements, soils benefit in the long run. One element, though not noticeably needed, may make another available, or it may serve as an antidote against toxicity from some element present to excess.

A typical formula for spraying fruit and ornamental trees should contain, per 100 gallons of spray:

10 per cent manganese
10 per cent copper
5 per cent zinc

Note: If acid salts are used, equal amounts of lime must be used to prevent injury.

1,000 Ewes—No Hay, Herders, Lambers

Condensed from Montana Farmer-Stockman

V. M. Long

ONE thousand ewes without hay, herders or lambers sounds like a distress call, but it's not. The sheep are happy, and everything is under control.

For the last 10 years I have handled about this number of ewes in this fashion with good success. In fact, if I had not done it this way I would have gone out of the sheep business along with nearly everyone else.

There is nothing complicated about it except that it took a little nerve at first. I raise wheat and barley at about one acre of grain for each sheep wintered and bunch all my straw behind a 20-foot combine. This means the straw piles are big enough to find under 16 inches of snow, yet not so large that the sheep foul up and waste much, if any. Sometimes I have native grass for additional roughage but often not. This year it has been "not" because of the dry fall.

I have fed from ½ to 1 pound of barley per head when barley was cheaper. The last few years I have sold barley and bought high protein cake and saved money, since ¼ pound of cake per head daily is enough.

I feed a mixture of barley and cake at first in the fall to teach the lambs to eat the cake. Start with not over a half feed and don't count the lambs as eating any cake at first. The mixture is put out on firm, native sod in about ½-gallon piles placed 10 or 16 feet each way. I hold the sheep back several rods from the feeding ground until the feed is put out, then go in front of them until near the feed and all the tail-enders have caught up and move them onto the feed in a compact bunch—this is important, or has been.

I like the newer idea of self-feeding concentrates, using salt as a diluting agent to prevent overeating. I haven't tried it yet, but they have used this method in Texas a number of years with success. If this idea works it would forever put an end to the problem of getting the weaker ones a fair chance at the concentrates. The proportion Texas ranchers use is 1 pound of salt to 5 pounds of cake in meal form.

No lambers? It's easy if you lamb entirely on grass. Start May 1 and cut the band up in small bunches of about 100 to a brush sheltered pasture large enough to run them about one month. Too large a pasture is bad.

Reprinted by permission from Montana Farmer-Stockman, Great Falls, Montana, April 15, 1950

I dock the small bunches separately about the third week, as most of the lambs will have been born by that time. I hold the bunches separately as long as I can before shearing about July 5. It takes quite a lot of woven wire fence but fencing is cheaper and more efficient than most hired help and much more dependable from year to year.

I do most of the lambing work on horseback, using a small, very gentle old cow pony. I use him to catch ewes with an ordinary sheep hook, as he will trail them, but this is very seldom necessary except in the use of lambing tents sometimes. I have given up trying to use a gut-wagon of any kind. In the small pasture the ewes stay right where lambs are born, which is the natural way. Ewes are less afraid of a man on horseback than on foot and, if properly tagged previously, very seldom need any help with their lambs.

When evening comes, or on the approach of bad weather, I ride around to the various pastures, and if the lamb has not learned to follow his mother into shelter, I use a special lamb carrier I have made of ½-inch rod fastened to an old broom handle.

I reach down from the horse and scoop up the lamb with the carrier, making sure I have one side of the carrier rod between his front legs so he cannot wriggle out. Then I ride slowly toward the brush, holding the lamb just a few inches off the ground. The ewe follows eagerly and unafraid, usually never suspecting a man is anywhere around. I have often moved a ewe and her lamb this way over a mile without excitement, which is always bad.

Some lambs die, perhaps a few more than if a full lambing crew were on hand, but some will die anyway and the additional neglected loss would not pay a tenth of the lambers' wages.

I urge young men, especially, to go into the sheep business if they are just starting out on a wheat ranch and cash is a little short. Nothing will go to waste on a fenced wheat ranch if sheep are on hand to pick every last head of down grain.

Start with not less than 50 nor more than 100 if you are a green hand. Get old ewes not wanted by a larger operator yet plenty good for an average of 1½ lambs or more.

You will make at least 100 percent on your investment the first year and more likely 150 percent now that sheep are high if you give them a little extra care. That is more than is possible with cattle and every wheat man needs a livestock reserve of some kind, especially now that surpluses are again in prospect.

Manure Means Money

Condensed from Utah Farmer

Dr. D. Wynne Thorne
Utah State Agricultural College

A DAIRY farmer with 20 cows has an annual cash value of $800 or more in the manure. This is based on an average increase of $5 in crop value from each ton of manure applied to the soil.

A value of $5 per ton of manure is not a guess. In a summary of six field experiments in Utah covering tests over more than 50 crop years an average increase of 0.73 tons of sugar beets was obtained from each ton of manure applied. If beets are worth $12 per ton, the total cash income value from each ton of manure is not $5 but $8.76. And these results represent the increased yield only from the first crop following the manure application. But manure increases yields of not only the crop immediately following the application, but also benefits several succeeding crops.

Farm manure, then, represents one of the great farm resources. It is time we brought the manure pile out from under the barn eaves and away from the mud and water and gave it the attention it deserves. Most of us do not realize the tremendous losses that can result from careless handling of manure.

To be ultra conservative in our thinking, let us not consider the benefits to soil aeration and tilth from manure additions. We will overlook the stimulation given to desirable soil microorganisms from manure. And we will completely overlook the growth hormones and other balancing influences that manure has on plant growth. We will only consider manure as a source of plant nutrients. On an average, each ton of manure contains 10 pounds of nitrogen, 5 pounds of phosphate and 10 pounds of potash. The cash value of these ingredients in a ton of manure when purchased as commercial fertilizers would be about $2.65.

Since farm manure is a major source of plant nutrients, first consideration should be given to preventing their loss between the time the manure is voided by the animal and the time it is worked into the soil. The magnitude of these losses is illustrated by the following table showing the relative water solubility of each of the fertilizer elements and of organic matter in various manures.

Reprinted by permission from Utah Farmer,
Salt Lake City, Utah, March 25, 1950

TABLE 1.—Proportion of fertilizer elements and organic matter of farm manure (including litter) that is soluble in water.

	Organic matter percent	Nitrogen percent	Phosphate percent	Potash percent
Horses	5	53	53	76
Dairy Cows	7	50	50	97
Steers	7	56	36	92
Sheep	7	42	58	97

With the above figures in mind it is startling to survey the condition of most manure piles, surrounded by a dark brown pool of water. In many cases, moreover, the manure pile is located squarely under the barn eaves so that water running from the roof will be certain to seep down through the manure pile and carry away additional plant nutrients.

The old concept that the best farm manure is the fine, well-decomposed material must be accepted with considerable reservation. In many cases it has been tramped and leached until a large portion of its content of plant food has been lost.

To conserve the nutrients in farm manure, we must conserve all liquids, preventing their run off or their soaking into the ground in the corrals or beneath the manure piles. To do this, two things are needed: All, or part of, our corrals should be hard surfaced; and our manure should be stored in a cement pit, or at least on a clay base away from the barn eaves to prevent excess leaching and loss of liquid. This may seem like an excessive expenditure of money. But in addition to the added health and comfort of animals, resulting from such a program, it has been found that the saving in plant food often pays for the project in one year.

A concrete manure pit is of great value in stimulating farmers to take better care of their manure. One which is inexpensive and adapted to our conditions is as follows:

Concrete bottom eight inches thick, three sides six inches thick, and 24 inches high. A slight elevation in the floor at the open end will prevent the escape of liquid and allow a manure spreader to be backed in for loading. The low sides will allow the manure spreader to be loaded from any side. If it is estimated that each cow and horse will void eight tons of manure per year, one-half of which would be left in the barn, about five yards capacity would be needed per animal. However, the manure should be piled at least three times as high as the low sides—or up to six feet high.

A roof could be added to the pit but the cost would be considerably increased. The pit should, however, be located away from the eaves of barns and preferably in the shade.

Accumulation of manure in hard-surfaced feeding sheds also conserves its value. Such a prac-

tice has been found profitable in sheds at the Utah Agricultural Experiment Station Dairy Farm.

One of the most valuable and most costly nutrients in manure is nitrogen. When manure remains in the pile a short time, a large part of the nitrogen is changed to ammonia. When manure is allowed to dry, much of this ammonia nitrogen immediately goes into the air as a gas. The usual practice of spreading manure and allowing it to stay on top of the soil and dry for several days or weeks before turning under may result in a loss of more than half of the total nitrogen content. One needs only drive by such fields to smell the nitrogen drifting away in the air. These losses may be largely prevented by working manure into the soil the same day in which it is distributed. This is particularly important in the late spring when the air humidity is low and the soil surface is dry.

To get the most value out of farm manure, the following points should be carefully considered:

1. Store manure on a tight floor away from the barn eaves. For most farms, a shallow concrete manure pit is best.

2. Hard surface the corral, or at least part of the corral where the animals may bed down and where the manure may accumulate.

3. Keep the manure pile moist.

4. Work manure into the soil as soon after it is distributed as is possible.

Phosphate fertilizers can often be applied with manure to advantage. When both are to be applied, mix the correct amount of phosphate with each load of manure. If 10 loads of manure are to be put on an acre and 300 lbs. of phosphate fertilizer are to be used, mix 30 lbs. of the fertilizer with each load of manure. This practice is especially worth while if the manure is to be plowed under. Plants feed readily on phosphate within clumps of manure. A moist piece of manure makes an ideal home for plant roots. The roots quickly grow throughout every part of a clump of manure within the root zone. These roots readily absorb the phosphate present and the plant is benefited.

The manure loader and other mechanical equipment have taken much of the drudgery out of handling manure. Mechanization also makes it possible to reduce losses in handling. There can be little doubt that there is no place on the farm where more money can be saved with less effort than in improving our methods of handling manure.

Don't Be Water Poor

Condensed from The Aberdeen-Angus Journal

W. W. Brooks

WATER, as well as an ample supply of forage, is necessary if live stock are to be taken from the range in a marketable condition.

Providing adequate water for live stock on range and pasture is not merely a question of developing enough wells and springs and ponds to supply the water needs. A proper distribution of stock water in relation to the available forage is equally important. An area capable of supplying an abundance of forage cannot be fully utilized if the water is not accessible to live stock grazing any part of the area. On the other hand, if there is already sufficient water for the number of animals that the surrounding grazing areas will support, additional water developments may merely encourage over-grazing and lead to unnecessary expense.

Live stock need dependable watering places that will provide water during all seasons of the year. While there is usually a surplus of water during the wet seasons, the dangers of a water shortage during dry spells are well known.

As the live stock industry has expanded, ranges have become more and more crowded. More intensive use of the range brought out the necessity for developing new water supplies. With the drying up of temporary water supplies, it is now essential to have more permanent storage reservoirs, drilled wells, and other reliable improvements.

Forcing live stock to travel long distances to water is harmful to both the grazing area and the live stock. On open range land, watering places should not be more than five miles apart. They should be distributed so that cattle will not have to travel more than two or three miles to reach water from any part of the range. In rough, mountainous terrain, live stock should not have to travel more than one mile to a watering place. On range or pasture the average daily consumption of cattle is about ten to twelve gallons a head. If stocking and forage conditions are similar, four times as many cattle will drink at a watering place serving a two-mile radius as at one serving a one-mile radius.

It is often advisable to heat water, since most live stock will not consume a sufficient quantity

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during the winter if compelled to drink ice cold water. Water should also be as clean and sanitary as possible. The quality of the water should be tested for turbidity, high salt content, or other impurities. Such testing should be done before any installation expense has been made.

Where soils, terrain, and drainage are suitable for the construction of a reservoir, it may provide a less expensive water supply than a well. A good well has certain advantages over a reservoir, however, if it can be obtained at reasonable depths. A well is less likely to fail when needed most, its location is more flexible, and it usually provides a better quality of water. It is the most satisfactory installation where water is needed for domestic as well as live stock use.

Expanding rural electrification is making possible completely electrified running water systems for more and more ranchers. By the end of 1952 it is estimated that nearly every farm and ranch in the United States will be able to have electrified running water.

With the progress in electrification have come welcome advances in supplying plenty of pure water from wells by electric pumps. These pumps have been made smaller and smaller for ease of shipping and facility of installation, with simultaneous increase in efficiency.

Teamed up with sufficient piping and a safe well, the electric pump constitutes real insurance against droughts and soil erosion from over-grazing on land where minimum water sources are located. At the same time this automatic system reduces manual labor and leaves the rancher and his men with more time for other ranch affairs. True basis of the electric water system is, of course, the well. Here is where the water dollar means most.

It has been agreed among experts that if water is found at a distance of less than twenty-two feet, it is called a shallow well. More than twenty-two feet, it is a deep well. Deep wells sometimes go down hundreds of feet before a water-bearing vein is reached. Charges for drilling are customarily by the foot and the price per foot increases as the well goes deeper.

At the present time there is no definite method known to determine the depth of a well that will produce an adequate supply of water. There are, however, certain steps that will help in locating the well in the most favorable spot. Near neighbors who have wells should be questioned on the difficulties they have encountered—how deep their wells had to be, the quality of the water, and the amount of flow. Often a competent geologist can foresee, from the topography and geological for-

mation, the most likely place to find water.

State or county Departments of Health should be consulted, for they have experts in both sanitation and geology who will advise without cost.

With modern pumping equipment, the well can be placed almost anywhere that is most favorable for finding water. The most important consideration is that no contamination results from barns, stables, stock pens, cesspools, dry wells, or septic tanks, either through proximity or through being on a higher level.

Wells should be located at a minimum distance of fifty feet from cesspools, stables, and other such sources of pollution. A distance of 100 feet is preferred.

The direction of the groundwater flow should be ascertained, if possible, and the well located so that it is not in the line of flow from a fixed source of pollution. Drains carrying sewage located within fifty feet of a well should be constructed of cast-iron pipe with leaded joints. No such drains should be located nearer than ten feet to any well. The well site should be well drained and at a higher elevation than nearby fixed sources of pollution, and the well top, curbing, and cover should be of permanent watertight material and raised at least one foot above the surrounding ground level. The well should also be watertight to a depth below the ground surface of at least six feet to protect against surface water seepage.

Shallow wells take advantage of a situation where a water bearing layer of earth is close to the surface. A hole big enough for men to work in with shovels can be excavated and lined with masonry, or a pipe with a special perforated point can be driven or a casing can be dropped into a mechanically drilled hole. Then a suitable pump is installed. The water that is available will have fallen, as rain or snow, on the ground within a small radius of the well itself. It then seeps into the ground until it reaches a clay or rock stratum to form a water bearing layer. The water level of a shallow well is likely to fluctuate greatly and in a long, dry period, the supply may fail completely. Shallow wells are also more subject to pollution.

Deep wells usually yield pure water and their flow is rarely interrupted. They may cost considerably more to construct than shallow wells, but their pumping equipment and the operating cost are little, if any, higher.

Wells are generally classified according to the method of construction, such as dug, bored, driven, tubular, and drilled, each being essentially an opening in the ground from which a supply of water is obtained. The first three types are usually shallow, generally not more than fifty feet in

depth. The fourth and fifth types, "tubular" and "drilled," are developed by well drilling machines capable of penetrating through hard consolidations and rock formations to depths of 1,000 feet or more.

Prior to the development of modern tools and equipment such as earth augers, boring tools, drive well points and drive shoes, the most common procedure was to dig an opening in the earth, generally three to five feet in diameter, to whatever depth would yield an ample supply of water. Filtering water by means of special cribs through sand, gravel, crushed quartz, and the like will remove dirt and sediment but it does not eliminate dissolved minerals nor justify the use of water taken from a source which is known to be contaminated.

The dug well permits the flow of water into the excavation furnishing a relatively large quantity of water from a shallow source. The walls of these wells should be curbed or lined with rocks, bricks, wood or concrete to prevent entry of surface water and caving. Most wells of this type are necessarily shallow and located at a low point in the surrounding terrain, in order to be as close as possible to the water table. Because of such locations, dug wells are nearly always subject to contamination from surface and subsurface drainage.

It has been proved beyond any doubt that a very high percentage of the dug wells being used are polluted. To those who are using this method as a source of water supply, whether for human or live stock consumption, it is recommended that every possible precaution be taken to guard against pollution. Aside from the dollar and cents value offered by a driven or drilled well, there is the assurance of safety and health, plus the advantages of sanitation and broader uses which are thereby made available.

The driven well is exactly what its name implies, consisting of an assembled string of pipe tightly connected and fitted with a well point at the lower end which is provided with a screen-covered body to permit the drawing of water. This is the quickest and most economical method of acquiring water in areas where only porous materials are found and there are no rock formations to be driven through. Various types of well points are available for the construction of a driven well, and the proper selection of the point is of utmost importance.

Ordinarily, driven wells are most practical where water can be obtained at depths not exceeding fifty or sixty feet. If water in sufficient quantity cannot be reached at a depth of twenty-five feet or less below the surface of the ground, it is not advisable to use

drive well pipe less than two inches in diameter, but preferably larger, so that a cylinder or jet may be inserted therein and be submerged in the water to permit the pump to function and make possible the delivery of water from the well.

Generally speaking, bored wells should not exceed depths of thirty-five to forty feet because of difficulty in development and since this type of well is especially subject to contamination from seepage of surface water capable of entering through the tile casing joints, unusual precautions must be exercised in selecting the location, protecting it from cave-ins, etc. The unreliability of this type of well indicates that the driven or drilled type will give greater satisfaction and assurance against pollution.

Tubular wells and drilled wells are usually developed when a well of larger diameter and greater depth than a driven well is required. Both are constructed by the drilling method and provide a safe, sanitary water supply when built with the use of proper materials by a competent well driller. Tubular wells are made up of pipe or casing, generally three inches or less in diameter, which extends from the base of the pump to the source of the water supply. Much skill and experience is necessary for the successful development of this kind of well; it is not a project to be attempted by amateurs.

Drilling progresses ahead of the pipe or casing on which a drive shoe is attached, and the operation of driving and drilling is continued down to the water bearing stratum. When the well depth is established, and drilling ceases, a flush well point, often called a tubular well point, with a turned coupling attached, is placed in the well and driven through the drive shoe into the sand until the entire length of the screen-portion of the flush well point is below the drive shoe.

Drilled wells are installed when more volume, diameter, and depth than practical in the tubular type are needed. In construction of a tubular well, the drilling operation stops at the water-bearing sand stratum; in the drilled well the casing or pipe is driven down as the well is drilled and extends either to water bearing sand or continues to rock.

If the well is finished in sand, a sand screen with bale bottom and lead packer top is lowered to the bottom of the casing or pipe. The pipe is pulled back to the top height of the straining portion of the screen. Lead packer is then expanded against the side of the casing or pipe, sealing the well. When the well goes down to rock, the casing or pipe is driven down until rock is reached. Then drilling commences into the rock to

the water supply. This type of well often does not require a screen.

A soundly constructed drilled well offers the maximum of efficiency, volume, and purity.

Upon completion of the drilling operation, the well should be pumped with suitable equipment which is furnished by the well driller. After the well has been cleaned of the residue and abrasives from the drilling operation, a screen is fitted into place and then the new equipment of correct size and style is installed. Almost all newly developed wells are contaminated by the process of the drilling operation itself and by dirt which accumulates on the pipe, casing, tools and equipment from open exposure and handling.

The purpose of equipping a well with a strainer, screen or extension screen is to provide an ample flow of clear water from the developed source of supply, preventing unstrained water containing particles of sand, gravel, twigs, or sodden materials from clogging and fouling the pumping equipment and protecting the mechanical functions of the system against premature wear or failures.

No strainer or screen, however, is capable of purifying contaminated or otherwise unsafe water, but it will keep unnecessary wear reduced to a minimum and offers protection against possible breakdown in water supply. Following the completion of the drilling and cleaning of a well, the next important step is the consideration of a strainer, the purpose of which is to screen out floating and movable particles of sand and foreign materials and to provide an ample flow of clear water from the developed source. There is a wide variety of strainers and screens to fit various types of installations.

The use of a strainer or screen within a gravel well will greatly increase the capacity of water that the well will yield. A well with a strainer has an advantage of greater water inlet area due to the circumference of the strainer together with its length. In order to obtain the greatest quantity of water from the well, care should be taken to make proper selection of the opening within the strainer or screen. Samples of water bearing strata (sand and gravel) should be carefully examined so as to determine the size slot to use within the strainer or screen.

In addition to providing clear water, these strainers are highly essential since they prolong the lives of pumps and cylinders, eliminating the possibility of choking the valve poppets and the clogging of working parts of the pump itself. It is advisable to consult manufacturers' catalogs to determine the best type of strainers, screens and check valve strainers for the particular installations.

The sterilization of newly con-

structed wells is highly important and often neglected. One simple method is to prepare a chlorine solution by mixing one heaping tablespoon of chlorinated lime in a little water to a consistency of thin paste, making sure all lumps are dissolved. This paste should then be stirred into one quart of water, allowing the mixture to stand a half hour or longer. The clear liquid can then be poured off, having a chlorine strength of approximately one per cent. One quart of this solution is sufficient to sterilize 1,000 gallons of water. Storage of the solution should be made in glass containers adequately sealed to prevent loss of strength.

The volume of water standing in the well should be estimated and for every 1,000 gallons of water pour one quart of the chlorine solution into the well. No harm will be done if too much solution is used as it is better to use too much rather than too little. After the solution has been poured into the well, the water should be thoroughly agitated and then permitted to stand for several hours, overnight if possible.

The next procedure is to flush the well thoroughly to remove the sterilizing agent. The first water removed may be used for washing down the wall of the well casing and then thoroughly pumped out before the water is used for drinking purposes. Many State Boards of Health require this sterilization of new wells.

When it is desired to have water tested for sanitary quality, it is advisable to write the Department of Health at the State Capitol. A complete description of the location and construction of the well should accompany the request and instructions will then be sent on how to proceed. If the water is found to be impure, methods of purification and suggestions for proper reconstruction will be indicated by the proper authorities.

It has been conclusively shown that all wells, to be free from surface contamination, should be carefully sealed. All water wells are subject to surface pollution to some extent; unless the dangers of this sort of exposure are realized, serious results may possibly occur. Many state health departments have adopted codes which require the sealing of water wells and even when codes do not call for sealing, use of this procedure is highly recommended. Well drillers are fully versed in the proper method of sealing wells.

How Use of Fertilizer Began

Condensed from Florida Grower Magazine

Dr. Wade W. McCall

University of Florida College of Agriculture

It was 101 years ago this year that the first fertilizer plant was built in the United States. Today, the manufacture of fertilizers is a major industry.

Just when, where, or how primitive man first discovered the virtue of fertilizers no one knows. Yet, somewhere back in the centuries past some observant individual must have noticed that where animal manure fell grass grew greener, stronger, and more abundantly and that where campfires of other years had burned, the vegetation had attained new stature and girth.

This man learned a new lesson. He started to use manure to help raise more crops, to help provide more food at a time when food was precious. The value of barnyard manure was well known by the ancient Egyptians, Greeks, Romans, and Arabs. Its use was described by them hundreds of years ago.

The value of lime to the soil was known to the ancient Celts, who used it to advantage in crop production. They, along with the Arabs, also recognized the value of wood ashes as a crop stimulant. The oldest treatises on agriculture deal with the value of waste wool, bones, and other refuse as fertilizers.

In the sixteenth century, when the first white visitors arrived in South America, they found that the Indians were well acquainted with the use of Guano to increase their crop yields. Those arriving on the shores of North America found the Indians of this continent using fish to increase the yield of corn. They placed a fish by each hill of corn to make strong, healthy plants.

In the early seventeenth century the colonists in this country first began using wood ashes extensively and later exported this material to Europe. During the same century the English began using ground bone as a fertilizer, and at one time it was claimed that they robbed the battlefields of Europe to supply the need for bones. In 1865 Sir Kinelm Digby used saltpeter (potassium nitrate) to increase crop yields.

Impetus was given to the development of the use of fertilizers by Theodore De Saussure, a Swiss, who directed the attention

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of the scientific world to the use by plants of the constituents of plant ash. The first commercial fertilizer was manufactured in England in 1842. Superphosphate was made by treating phosphate rock with sulfuric acid. This material is still popular.

In the United States use of commercial fertilizers really began about 1830. In that year the first Chilean nitrate was imported and used. Use of this material increased rapidly until today it is one of the most widely used top dressing materials and is well known by practically every farmer in the South. Also during the same year, Peruvian Guano was first imported. Its use grew rapidly until about 1872, when the use of this fertilizer began declining. Now it is not very widely used. It was of great importance to our farmers because it taught the value of using "complete" fertilizers on our soils. Its influence is still shown today in many localities where all fertilizers are referred to as "guano."

In 1849 the first fertilizer factory began operation in Baltimore, Maryland. From this beginning we have, today, more than 1100 fertilizer factories, supplying more than *fifteen million tons of fertilizer* to farmers *each year*. The fertilizer industry grew from one which utilized the waste products of packing houses and other industries, into one of the largest heavy chemical industries in the world. As demand for more and more food to feed the hungry peoples of the world grew, the use of fertilizer increased. Now even with the enormous tonnage produced, there are shortages of fertilizer materials.

The Southern states use most of the fertilizer produced in this country, although many other sections use large quantities of fertilizer also. The three leading states in the use of fertilizers are North Carolina, Georgia, and Florida, in that order—Florida using a total of 885,440 tons a year. Most of this fertilizer is applied to corn, cotton, wheat, vegetables, and citrus fruits, though the amount applied per acre for the different crops would be in a different order.

The major plant foods found in fertilizers today are nitrogen, phosphoric acid, and potash. But, as time goes on, we will find that more and more of the minor elements also will be added to fertilizers in supplying crop and soil needs. In Florida this is becoming more and more apparent—where the elements of magnesium, manganese, and copper are already standard in citrus fertilizers, where copper is necessary for crop production on organic soils, and where zinc is necessary for corn production on some of our sandy soils. But Florida leads the nation in the use of minor elements.

Range Rearing Lowers Cost

Condensed from Poultry Tribune

D. C. Henderson and H. C. Whelden, Jr.
University of Vermont

How would you like to find $420 left in your expense account after all the bills have been paid?

In a two-year investigation at the University of Vermont, $420 was saved in feed costs by rearing a flock of 2,000 birds on range compared with confinement rearing.

Poultrymen usually allow 60 percent of their total cost of rearing replacement stock for feed. However, the Vermont experiment proved that this expense can be reduced 5 to 10 percent, and possibly more.

White and Barred Rocks, reared to 24 weeks of age in complete confinement, consumed an average of 2.4 pounds more feed than similar birds reared on range. Converted into dollars, this means that 500 birds in confinement ate $51 more purchased feed than a similar number on an acre of range. The $51 saving of the range-reared birds is good rent for an acre.

Many practical poultrymen prefer to grow pullets and breeding cockerels on range, because they believe they can house a better pullet on less feed. They also think they can reduce laying house mortality and increase egg production and hatchability.

The object of the investigation conducted at Vermont was to secure additional proof of the merits of the range method. Feed costs, efficiency of gain, grade, and market finish of range birds were compared with similar birds reared in confinement. Results were quite conclusive.

Vermont's results were in accord with findings of other experiment stations and of practical poultrymen. However, different methods of management than those used at Vermont, particularly feeding and range conditions, may produce results that will show very little feed saved due to range.

Restricted feeding was used on range. This was an important factor in saving feed. The birds were forced to follow some of the practices their ancestors employed to survive—they had to hunt and work for their feed. Commercially prepared feed was restricted, but natural nourishment, such as grass and legumes, was available in

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abundance for the energetic pullets.

During the 12 to 24-week age period, the birds were fed by the pellet-scratch system. Pellets and scratch were scattered over the range in the morning before the heat of the day and again late in the afternoon after the mercury began to fall. The evening feeding was a full meal. The birds were given all the pellets and scratch they would clean up before going to the range shelters.

The morning feeding was half the amount they received at night. This was just a coaxer to encourage the birds to scatter over the range to hunt and work for feed.

Feed was distributed on different areas; so the pullets had a clean "tablecloth" for each feeding. There was a saving on feed troughs, because commercially prepared feed—a mixture of growing mash and pellets and scratch grain—also was served on the range.

Pellets and scratch were mixed in varied proportions according to the age of the pullets. Birds 12 through 14 weeks old received two parts of pellets by weight to one part of scratch grain. Birds 15 through 17 weeks old were given one part of pellets to one part of scratch grain. Birds 18 through 24 weeks old received one part of pellets to two parts of scratch grain.

Satisfactory results cannot be obtained with restricted feeding unless adequate and palatable grasses and legumes are available. The University of Vermont range is located on relatively heavy soil. The pasture is made up largely of Kentucky bluegrass, white clover, and birdsfoot trefoil. It is grazed relatively close (approximately 500 birds to the acre) and clipped during the fore part of the season when the birds cannot consume the grasses as fast as they grow.

Birds used in the tests were brooded and reared together until the ranging period. Sixteen hundred and 1,700 birds were used in the tests during 1948 and 1949, respectively. Approximately 1,100 birds were put on range at 12 weeks of age in 1948, and the remaining 500 were confined to the brooder house. Each bird was allowed 3.6 sq. ft. of floor space.

Similar management was followed in 1949. Birds in confinement were raised under more ideal conditions that those found on many farms, in that plenty of room was provided. Feeders were supplied, and the mash, pellet, and scratch feeding system was followed. Pellet and scratch feeding in confinement would have resulted in feather pulling and cannibalism. Therefore, mash was fed in addition to pellets and scratch. Birds on range had access to average pasture conditions and shade.

Satisfactory results were ob-

tained using the feeding and management methods described. At the end of the two-year study, the report showed that the range-reared birds were more uniform and carried deeper color pigmentation than the confined birds. The range-reared birds also carried firmer muscling and better handling quality.

Weights of the pellets at housing time were almost the same. In the 1948 test, the pullets reared in confinement were one-tenth of a pound heavier than the range pullets. In 1949, there was no difference in weight. There also was no significant difference in mortality and culling in the adult birds from the two groups.

Feed savings due to the difference in management were significant. Confined birds used an average of 7 percent more feed to maturity than similar birds grown on range from 12 to 24 weeks of age. In 1948, the pullets in confinement consumed 9.7 percent more feed than the range birds. The feed saving due to range rearing was 4.4 percent in 1949.

Extremely dry weather in 1949 limited the amount of pasture available and probably accounts for the reduction in amount of feed saved. The greatest saving in feed was seen during the 16 to 24 week period on range. Therefore, it would be desirable to range as long as possible in order to take full advantage of this saving during the latter part of the ranging period.

Data from both years show that range-reared birds gained weight more efficiently than confined birds. Feed consumption per pound of gain was lower on range birds than on confined birds.

This investigation seems to indicate that range rearing has advantages over the confinement method. Range birds were grown to maturity on less feed, with a slightly higher feed efficiency. They were more uniform and firmer muscled at housing time. There was no significant difference in weight at the end of the 24-week period. The restricted method of feeding and good pasture undoubtedly accounted for feed savings.

New Quackgrass Killer

Condensed from Ohio Farm and Home Research

C. J. Willard

If an entire field is infested with quackgrass, tillage methods of eradication are simpler and more economical than any chemical method. However, most quackgrass infestations start as small scattered patches which are difficult to treat by cultivation. Here, chemical control has a real place.

A new chemical, trichloroacetic acid (TCA), has been giving satisfactory results in killing quackgrass since the summer of 1947. TCA is the most promising grass killer on the market today, but it is too new to give definite, economic rules for its use. This article gives some suggestions for its use and some indication of its limitations.

TCA is commercially available as sodium trichloroacetate—a white powder with a considerable tendency to cake. Ammonium trichloroacetate has also been used but has shown no advantage over the less expensive sodium salt. Applications are made in water solution at any convenient concentration. Dilute sprays may have somewhat greater value on heavy foliage, otherwise the amount of water used to put the material on is unimportant. One pound per gallon is a generally convenient dilution. Any type of sprayer may be used. The solution tends to corrode metals and should be thoroughly cleaned out of the entire sprayer when spraying is completed.

TCA is only slightly selective in its action. It is much more effective on some plants than others, but it kills or injures all plants at some rate. No recommendations can be made for its use on quack in any growing crops at this time. It might be used under trees, or to take some annuals out of some perennial crops, but even these uses cannot be recommended now.

TCA cost about 55 cents a pound in 1949. There is reason to anticipate lower prices in 1950.

The best treatment has been to plow the quackgrass, work down as for seeding, and apply the chemical at once to the soil. With this method we have had near-total eradication from approximately 50 pounds per acre of the commercial sodium salt, as sold, applied in August. There was excellent control, just a few sprouts the next spring, from half that much. It happens that nearly all of our tests have been on quack

Reprinted by permission from Ohio Farm and Home Research, Wooster, Ohio, March-April 1950

plowed shortly before or shortly (2 to 6 weeks) after application. This is a condition which other experimenters find to be most favorable for economical results. For treating undisturbed quack, 100 pounds per acre is suggested by the Research Committee of the North Central Weed Control Conference. Some of our tests suggest that this may be excessive for Ohio. No practical rate of applying TCA (or any other herbicide) will *eradicate* quackgrass at one treatment. Retreatments, or plowing, disking, or cultivating to finish the job, are to be expected and planned.

Treatment is most effective when the soil is moist and offers good growing conditions. If TCA is applied on dry soil, there will be no effect until rain carries it into the soil. Too much rain may carry the TCA below the quackgrass root zone and reduce or prevent its effectiveness.

When TCA is applied on quackgrass leaves, it causes some immediate burning, but its important effects are through absorption from the soil. Plots mowed and hay removed before treatment have given as good or better results than unmowed.

The best time of year to treat quack with TCA is not yet known. Successful applications have been made at all seasons. The soil should be moist and conditions favorable for active growth for best results.

The residual effect of TCA is not clear. In our tests it has apparently nearly disappeared from the soil in 60 to 90 days during the growing season, or over winter. Other experimenters report some residual effects for over a year.

TCA behaves much like sodium chlorate—it moves through and acts primarily in the soil, and it is more or less a general weed killer. It is more effective per pound than chlorate and is less likely to sterilize the soil for long periods.

TCA can also be used on other weedy grasses. It is one of the most promising chemicals for use on Johnson grass, but more chemical is required than suggested for quackgrass. We do not, either in Ohio experiments or in those of other states, have satisfactory evidence as to the best way to treat Johnson grass. Experiments are in progress. Germinating annual grasses are readily killed by much smaller doses; as little as 5 to 10 pounds per acre has been effective. TCA solution is caustic to the skin if left on it. TCA is not seriously poisonous, but ordinary precautions in handling it should be used. There is probably little or no hazard to livestock in a pasture containing TCA sprayed spots, but until the hazard is more definitely known, complete safety may be obtained by keeping stock off

sprayed areas until after a good rain. TCA is so soluble that the first good rain will wash it off foliage into the soil. If applied at once, TCA is compatible with 2,4-D.

Ways To Repel Deer

Condensed from Pennsylvania Farmer

David G. White

DEER commonly damage fruit trees in two ways; they eat buds or fruit, and bucks often break limbs by rubbing their antlers up and down young trees or branches. The total damage by deer in Pennsylvania and other states from Maine to Washington is enormous. Just what this total would amount to in dollars is difficult to estimate, but the damage is so extensive that numerous ways to repel deer have been tried by individuals and institutions.

In addition to shooting deer which appear in fruit plantings, the other methods of repelling them can be divided roughly into two categories. One category would include all the different mechanical devices and the other would include chemical treatment of the trees. Two methods reported in Washington do not fit into either of the above classes. In one case the fruit grower fenced a pack of dogs within his orchard and claimed the dogs kept the deer away. Another fruit grower placed attractive feed for the deer in places where they could not do damage and claimed that they remained out of his orchard to a much greater degree.

Mechanical devices that have been used to repel deer may be divided into three types: (1) those which act as a physical barrier; (2) those which present a frightening appearance; and (3) inventions designed to emit a frightening noise. Of the first type, the most common barrier is an eight-foot fence, which is effective when kept in good repair. The disadvantage of such a fence, of course, is the high cost. Prior to World War II the Pennsylvania Game Commission furnished the fencing in justifiable cases without charge, while the fruit grower furnished the posts and costs of erection. At present the Game Commission is unable to obtain the fencing and most growers feel they cannot afford such a fence.

Another type of barrier that has been used with variable success in the past 10 years is the electric fence. In some instances a single

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Pittsburgh, Pennsylvania, May 13, 1950

strand or even two strands were effective for a limited time, but then the deer lost fear of the fire and either jumped over or crawled under it. A livestock man in Texas devised a sort of double fence that kept the deer out of his fields a good portion of the time. This barrier consisted of an ordinary stock fence supplemented with a single electrically charged wire strung about 20 inches above the ground five feet outside the stock fence. Apparently the deer touched the single wire and were shocked but hesitated to jump because of the danger of landing on the stock fence. During some seasons, however, the deer jumped over both fences. A disadvantage of electric fences is the fact that they can be easily shorted and consequently fail to shock and they do not always operate well during the winter season.

An additional type of physical barrier, designed to prevent damage from rubbing antlers, involves placing three posts around the base of each young tree so that a buck cannot get his antlers through the posts to rub on the tree. This method is expensive and obviously does not discourage the animals from eating buds.

Mechanical devices which present a frightening appearance include such things as scare-crows, white or colored rags, and flashing lights with or without mirror combinations. In general such devices reflect the mechanical skill of the fruit grower but do not result in consistent discouragement of the deer. In every case reported such gadgets have been effective for relatively short periods and thereafter the deer apparently become accustomed to them and are no longer frightened.

The third class of mechanical inventions emit some sort of noise that is supposed to be frightening. These exploders are made so that water drips on calcium carbide causing the generation of a gas which is exploded by a pilot burner and sounds about like the report from a 12-gauge shotgun. These can be adjusted to fire as often as four times a minute or as slowly as once every 10 minutes. One exploder is claimed to protect about 1,000 trees from deer. Accounts of the effectiveness of exploders to repel deer do not always agree; some growers have found them effective over periods of years and other growers have found that the deer apparently become accustomed to the noise and resume damaging their trees.

Recently we tried the effects of specific sound waves on deer at Cohick's Deer Farm near Salladasburg, Pennsylvania. Unfortunately no one sound wave was found to be irritating to deer such as occurs with smaller animals like mice which can be driven into fatal spasms if exposed to a certain sound from which they cannot

escape. The mice would not die if they could escape, and in the case of deer the idea was that some sound wave would be so irritating, not just frightening, that they would run far away from the source. We discovered one interesting detail about deer that may prove of value sometime; deer hear sounds which are much higher than sounds audible to humans. This preliminary test with specific sounds does not eliminate the possibility that some combination of two or more sounds might be irritating to deer and serve to repel them. If such sounds were above the range of human ears then they might be used to keep deer away from orchards. The problem is more complicated than we had hoped.

It is possible that a constantly changing radio program blasting through an isolated orchard would discourage deer from entering the area. This type of "noise" has been reported to keep birds away from cherries in some instances. There might be difficulty, however, in obtaining all night programs necessary for deer control and, in addition deer might become used to musical programs and not be repelled. Perhaps an automatic record changer hooked up to a radio amplifier might create a more disturbing noise than a radio program. A timing device could be attached so that a record would be be played only three minutes out of every fifteen minutes, for example. Some loud record with human voices included, such as "Mule Train," might be expected to be more frightening than a more soothing musical type of record. The records could be changed periodically to eliminate the possibility of deer becoming accustomed to any one record.

The second category of deterrents for deer includes various chemicals which generally may be divided into those which result in a bad taste and those which give off an odor disliked by deer. Of the several compounds now on the market, zinc dimethyldithiocarbamate-cyclohexylamine complex has created considerable interest. Plant parts sprayed with this material are extremely distasteful to deer and it is reported to be an effective repellent until new growth has developed which has not been treated. Several applications throughout the growing period are reported necessary to discourage deer from eating the terminals of young fruit trees. Although this and similar materials may be of value under some conditions, in general taste repellents are all subject to two criticisms: repeated applications are necessary and they cannot be expected to deter bucks from rubbing antlers on young trees.

The second group of chemical repellents includes those which give off an odor disliked by deer.

Many types and arrangements have been tried by different people with different degrees of success. Some fruit growers have placed tar paper cones around the middle of the tree leader and others have tied rag dolls soaked in kerosene or creosote on the branches. Diluted creosote also has been painted on the trunk and larger branches as a repellent and oil of anise has been used with moderate success. Blood albumen painted on the trunk has been reported effective, about like lime sulphur painted or sprayed. Two of the most effective odor repellents reported are naphthalene flakes and lump asafoetida. Either of these materials suspended from the branches in little cloth bags apparently repel the deer as long as the odor persists. Both of the materials require renewal whenever the odor diminishes and the period of effectiveness depends chiefly on the weather. More than one bag would be required for larger trees. It is possible that a fruit grower might prepare a large number of the little bags and tie them throughout his orchard to an advantage.

One thing is certain. As yet there is no panacea to repel deer indefinitely.

Renovated Pastures

Renovated pastures at the LaCrosse soil conservation experiment station have yielded three times as much dry forage as straight bluegrass pasture. All fields were limed and well fertilized, but the average bluegrass yield was less than one ton to the acre. Land with alfalfa, medium red clover, and bromegrass gave nearly three tons to the acre.

Another statistic from the pasture trials showed that run-off and soil loss were less in pastures renovated with a field cultivator. Land with an 18 per cent slope, and plow cultivated, lost over five and a half tons of top soil to the acre. Land renovated with a field cultivator lost about 40 pounds to the acre. Broken sod left on the surface by the field cultivator protected the soil throughout the season, and saved more soil than on pasture untouched in straight bluegrass.

Overgrazing will reduce yields whether pasture is renovated or not, say the LaCrosse experimenters. They found that moderate grazing on renovated pasture increased yields about 20 per cent over heavily grazed pasture.

—*Farm Science Report*
University of Wisconsin

The Virus Problem In Berry Crops

Condensed from American Fruit Grower

J. B. Demaree
U. S. Dept. of Agriculture

VIRUS DISEASES in berry plants are not different basically from those found in other woody plants. The infective agent inhabits all portions of the plant, but it cannot be seen with the ordinary type of microscope and its presence can be known only by its effect upon the living plant.

Virus diseases of berry plants are not transmitted by mechanical means, such as pruning or cultivating practices; neither are any of them transmitted through the medium of seed. All are transmitted by vegetative propagation. All are either known or suspected of being spread in berry plantations by the aid of insects feeding (by sucking) upon a diseased plant, then migrating to and feeding upon a healthy one. Insects that are capable of transmitting virus diseases are called vectors. Aphids, or plant lice, and leaf hoppers are the most common and efficient vectors associated with berry crop viruses.

So far as we know, each virus disease affecting berry crops is confined to a particular kind of plant or to a group of closely related species. Consequently, although the agents causing virus diseases in our various berry crops are fundamentally similar, they nevertheless differ in some respects and are considered separate entities.

Raspberry Viruses

In the early part of this century, the once thriving raspberry industry in eastern United States declined rapidly. Fields that previously yielded good crops declined in vigor and productivity, resulting in the discontinuance of the industry in some of the older raspberry-growing sections.

The cause of this unproductiveness was at first attributed to unfavorable soil and climatic conditions and the trouble was referred to generally as running-out of varieties, a legendary term applied to similar and then mysterious maladies of potato, tobacco, and other plants. The trouble was later found to be due to an infectious virus disease. In fact, several virus diseases entered into this raspberry decline complex. Some half dozen are now recognized—namely, yellow mosaic, red mosaic, two types

Reprinted by permission from American Fruit Grower,
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of leaf curl, mild streak, and severe streak.

Prior to 1920, surveys showed that some plantings of most varieties were lightly infected. These were carefully inspected and all diseased plants were removed for the following two or three years. By this means a stock of plants relatively free of virus diseases was developed, and from those fields propagations were made for replacement of the diseased stock throughout the country.

Diagnostic symptoms of the two forms of mosaic are similar in many ways but distinct enough so that they may be separated by inspectors and others well informed, but not easily by the novice. Many factors influence the symptom complex. Vigor of plants, varieties grown, sections where grown, aphid population, time of year, and weather conditions either suppress symptoms or accentuate them. Under certain conditions a red variety infected with mosaic may show only slight symptoms; under other conditions the leaves will be yellowish, speckled, mottled with yellow and light green blotches, and the entire plant will be dwarfed. Including the above symptoms, the cane tips of black varieties will be bent, blackened, or dead, and the plant will be extremely dwarfed and may die within two or three years.

As a group, the black varieties are damaged a great deal more than the red varieties. Although all take mosaic, there is a defference in the tolerance among the black varieties. Cumberland and Dundee, for example, are damaged less than Plum Farmer under the same conditions.

More extreme differences in mosaic tolerance and resistance exist among the red varieties, but injury is never so great as in the blacks. Varieties like Ontario, June, Viking, Marlboro, and Perfection cannot be successfully grown under heavy aphid populations. The Latham, even though 100 per cent infected, may show little or no evidence of infection and maintain a high berry production. The purple variety Columbia is thought to be totally infected, yet is widely grown in New York and produces good crops.

Another group of red varieties, including Lloyd George, Washington, Willamette, Imperial, and Pynes Royal, seldom, if ever, become infected with mosaic; and Antwerp, Herbert, Newburgh, Marcy, Milton, and Indian Summer become infected very slowly, even when subjected to extreme exposure. This is due to some inherent property in these varieties which makes them distasteful to the insect carrier of the virus, and the insects either will not feed upon those varieties or, if they do the population increases slowly.

Curl, another virus disease of

raspberries, was much more prevalent in Ohio and some other sections 40 years ago than now. At the present time, in well-cared-for plantings, only scattered plants may be found infected with this disease.

Symptoms are well defined and therefore the disease lends itself to roguing. Signs of new infections may show the first season on individual cane tips. The following year the entire bush will be somewhat dwarfed. By the third year all canes are dwarfed to 12 inches or less. After the first year all leaves are abnormal. They are darker in color than healthy ones, sometimes have a bronze or a glossy appearance, and are curled downward along the margin. The canes are stiff, brittle, and frequently do not branch. Fruits are worthless after the first year of infection. The disease is spread in fields by a small aphid different from the one that transmits the mosaic diseases.

Still a third disease of the virus type in our black raspberry plantings is known as streak. There are two forms, one called "severe streak" and the other "mild streak." Forty years ago severe streak was prevalent in New York and Michigan and caused damage to raspberries in northern Ohio; but it is rarely seen now. With severe streak infected bushes are considerably dwarfed; the leaves may show slight indefinite mottling; the tips of the leaflets turn downward, forming a hook, or the leaflet may become twisted in the shape of a loose cylinder. Cane tips seldom root to form tip plants; consequently, the disease tends to eliminate itself by non-propagation of infected plants.

The name "streak" is obtained from a fairly constant character of longitudinal dark blue stripes on the surface of the new canes near the ground.

Mild streak is undoubtedly the most important virus disease in black raspberries, at least in eastern United States, at the present time. It has been spreading for a number of years and it is now not unusual to find plantings with 25, 50, or even 100 per cent infection in western Maryland, western Pennsylvania, and in the Finger Lakes section of New York.

The disease has about the same importance now that the mosaics, curl, and severe streak had during the first two decades of this century. The increase of this disease coincident with the decline of other virus diseases of raspberries is due to the less conspicuous manifestations of symptoms in the case of mild streak. Infected plants show no dwarfiing and no well defined leaf abnormalities. They blossom profusely and set fruits. The berries appear normal until about the ripening season. Ripe fruits are one-fourth to one-third smaller than those produced on

disease-free plants, are seedy and dry, and are devoid of the usual gloss.

When a large percentage of the plants are infected in any one field, the harvested crop presents an unattractive appearance and is of poor quality. The leaves during midsummer are somewhat yellowish and the tips of the leaflets are hooked downward very much as in severe streak. Another diagnostic symptom, but not a very constant one, is an inconspicuous bluish streaking of the new canes and fruiting branches. After the bloom weathers off the canes, the markings are obliterated.

The most suitable period for inspection for mild streak is during the first half of the harvest season. Ordinarily, inspections for virus disease detection are made during early summer and again in the fall. Mild streak does not show during those periods. Undoubtedly an insect carrier spreads the disease, but the identity of the insect is not known.

Blackberry and Dewberry Viruses

Blackberries and Dewberries are relatively free of virus troubles. A few have been reported, but none has approached the importance economically of the raspberry viruses. Blackberry dwarf has been reported as occurring in the Pacific Coast States in the varieties Phenomenal and Logan. Relatively few plantings are infected but considerable loss occurs in some fields, infected plants become extremely dwarfed, internodes of canes are shortened, and are almost spineless. The leaves are small and distorted. Fruit, when formed, is about normal.

Sterility in blackberries seems to be increasing in eastern United States and, in some cases, it may be a virus type of disease. Affected plants are never dwarfed and leaves appear normal. The plants blossom but berries do not form.

Strawberry Viruses

Virus diseases are prevalent in strawberries in North America, Europe, and the British Isles. Four diseases of this type have been reported from the Pacific Coast, namely, yellows or xanthosis, crinkle, stunt, and witches'-broom. The last two are of slight importance.

Crinkle is a name applied to a virus form at one time prevalent in Oregon, that caused dwarfing of plants and crinkling, mottling, and distortion of leaves. It is suspected now that crinkle is a mild stage of a more severe type of a virus disease.

Yellows, however, is widespread and does considerable damage in all three of the Pacific Coast States and has attained rank of first importance. Growers are becoming more and more concerned about its increasing prevalence and the

lowering of berry production due to the disease.

The variety Marshall constitutes over 90 per cent of the strawberry acreage in Oregon and Washington. Symptoms of yellows show fairly well in this variety—mild to extreme dwarfing, thin stand of plants, and some yellowing of the new foliage, especially in spring and fall.

The expressed symptoms vary greatly in different districts and fields and even in the same field, from very mild to extreme. These differences of effects upon plants are confusing to both growers and investigators and are attributed to climatic influences, soil fertility, and to different strains, or forms, of the virus present. Symptoms show best in the cool, foggy sections and where soil is fertile, where healthy plants attain their maximum size and present a greater contrast to infected plants.

Spread of the disease is accomplished by two methods. First, by runner plants originating from infected mother plants; second, by the white strawberry aphid. This aphid is abundant during the fall and early spring in all of the principal western strawberry growing sections. Winged forms serve as carriers of the disease to nearby fields.

Several methods have been employed to lessen the spread of yellows and to enable growers to obtain clean, or relatively clean, plants. Roguing of young fields, where the incidence of infection is not high, has given some relief—provided that the aphid population is low and the fields are separated at least one-half mile from old infected fields.

The use of virus-free plants for setting new fields located in an isolated area where the aphid vector is absent and periodical inspections by a trained personnel, give the best assurance for growing plants with a maximum productive life. Spraying fields with an aphidicide during spring and autumn is being recommended. An added insurance is late setting of plants at a period when the population of winged forms of aphids is low; thus, the field will escape extensive infection during the first growing season.

The strawberry virus situation in the rest of the country is somewhat different. The variety Marshall, which serves as a good indicator for the presence of virus diseases, is not grown east of the Rocky Mountains. Therefore, the growers have no standard to judge the extent of virus infection. Nevertheless, virus diseases occur in eastern strawberry regions and to a far greater extent than is ordinarily suspected. Some varieties are probably totally infected.

Three types of viruses are recognized in the East on strawberries. Two are of relatively

minor importance. One type, known as "leaf curl," is occasionally seen in Maryland, New Jersey, New York, and New England, and causes the leaflets to twist and form a loose cylinder. Dwarfing is not a conspicuous symptom and runner plants are formed as in normal plants.

Another type, locally called "multiplier plants," has been known in northern Wisconsin for many years. Infected plants are bushy, due to the formation of several adventitious buds from the main crown. Runner production is scanty and the runner plants root near the old plants.

Both of these types are conspicuous and easily rogued. No vector is known. If a vector is not involved, then spread takes place only by setting infected daughter plants.

The most widely distributed strawberry virus in the East is a form of yellows, similar to or identical with the one on the Pacific Coast. Just how long this disease has been present in the East is not known; but it is thought to be of recent introduction, as growers are just now beginning to complain about difficulty of obtaining good stands of plants. However, it may have been present for a long time and only recently have varieties with easily recognized symptoms been widely grown.

Yellows was first observed in the variety Catskill, by the writer about 10 years ago. Now yellows-free Catskill plants are difficult to find. It was recognized next in the Dorsett and now most Dorsett fields are infected. In fact, it is now difficult to find virus-free plants of any variety, especially along the middle Atlantic seaboard. Even some of the newer varieties are infected, which indicates they become infected prior to, or soon after, their introduction.

Symptoms of the yellows virus disease are not at all conspicuous in most eastern strawberry varieties. There is no mottling, spotting, or streaking of leaves, only slight yellowing of autumn-formed leaves of some varieties. In other varieties the only abnormality that may be recognized is a slight to moderate dwarfing of plants, due to short leaf stems and their horizontal, not upright, growth.

The effect in some varieties is, in addition to dwarfing, a marked reduction in the number of runner plants, which results in a thin stand of plants. Such varieties as Fairfax, Fairpeake, and Pathfinder, when infected, produce very few, if any, daughter plants. Infected Premier, Blakemore, and Gandy, normally heavy plant producers, form a moderate to almost the usual number of plants. Such varieties may be considered as tolerant to the virus and detection is difficult, or impossible, unless

they are grafted to some variety, such as Marshall, that shows clear diagnostic symptoms.

There is great need at this time of finding virus-free plants of our best varieties for use in propagating healthy plants to replace the run of plants now propagated.

Yellows is spread by a white aphid similar to the one that serves as the virus carrier on the Pacific Coast. The abundance and distribution of the eastern aphid species is not known. It has been seen in Maryland every year since 1940; at Raleigh, N.C., in the fall of 1947; Teachey, N.C., spring of 1948; Geneva, N.Y., spring of 1947; and was collected in Massachusetts in the fall of 1949. It is quite certain, however, that the virus carrier is not so widespread in the East as is the one on the Pacific Coast. If this aphid has become established in only a few restricted areas in the East, then it will be comparatively easy to maintain virus-free stocks if grown in non-aphid-infested regions.

Blueberry Viruses

One virus disease is known in blueberries and it is referred to under the name "stunt." Infected bushes become considerably dwarfed; new growth is short and bushy; and the leaves are small and yellowish, mainly at the tips and along the margins. Stunted bushes blossom and set fruit but the berries fail to develop to normal size. They have an unpleasant flavor, and do not separate easily from the stems. These berries may hang on the bushes until fall. New canes rarely develop from the base of an infected bush, and when they do their growth ceases at about 12 to 18 inches. When an old stunted bush is cut back to the ground, many new canes appear, grow about one foot, and become bushy due to the production of several lateral shoots.

All varieties seem to be susceptible to stunt, but there is a wide difference in tolerance. The variety Rancocas seldom shows symptoms, even when exposed to heavy infection. The Harding variety takes the disease but is only slightly damaged. June, Dixi, and Stanley are also relatively tolerant.

Potentially, stunt is the most destructive disease attacking blueberries. Fortunately, at the present time there are not many fields with infected bushes. In North Carolina, if not rigorously rogued, infected fields of all varieties except Rancocas may be abandoned after five or six years on account of diminished production.

Stunt is comparatively a newcomer in horticultural crops, known only since about 1930 and first proved to be of a virus nature in 1942 by R. B. Wilcox in New Jersey. The disease is totally destructive to individual infected plants.

General Outlook

There is nothing new about the control of small-fruit virus diseases. Everlasting vigilance in preventing their introduction on one's farm and prompt removal of all plants appearing to be dwarfed, having mottled, yellowish, or misshapen leaves, or producing abnormal fruits are matters to which all growers should pay strict attention. Precautions must be taken against bringing in virus diseases with varieties that are symptomless carriers.

Farmers May Raise Arthritis Remedy

Some day you or your Southern neighbor may grow plants that will help counteract two of our most crippling diseases—rheumatoid arthritis and rheumatic fever.

One plant is a tropical vine called stophanthus sarmentosus. The other is a tropical yam. Both yield substances from which a drug called cortisone (sometimes called Compound E) can be made.

At present tiny quantities of this drug are made from ox bile. But it takes the bile from 40 steers to make one day's dose for one person. And it takes 37 chemical steps to do it.

Extraction of the drug from stophanthus seeds or from the yam takes but 20 steps. And we can grow all we want of it.

The only variety of stophanthus that is known to yield the drug is a native of Africa—and it's illegal to cultivate it there, because natives make arrow poison from it. However, other varieties grow in Florida, so that it may be possible to grow the right variety here, too.

An expedition of government plant explorers is abroad now, looking for adapted varieties. The plant breeders may be able to help, too.

The tropical yam is grown in Mexico for food, and has been found wild in Arizona, New Mexico, and parts of Texas.

It will take several years to solve the agricultural problems and the chemical problems, but arthritis and rheumatic fever sufferers now have some hope of relief, eventually.

—Farm Journal

Asparagus—A Favorite Vegetable

Condensed from New England Homestead

C. O. Morris

AFTER fifty years in growing vegetables of all kinds in my "home vegetable garden," almost everything in the seed catalogs from peanuts and cotton to garlic and popcorn, as well as all the standard things, I can say that my asparagus beds have given more actual pleasure than anything else. A bed I planted in Connecticut six years ago, costing but a few dollars for plants, yielded 48, what we call "messes," three years later, which at prevailing prices were worth at least $24. As the years go by, the bed is more productive each year. When properly made and cared for, a bed should last 25 years.

Here is how I make my beds. Any time in the fall before the freeze-up, I carefully prepare the soil. First I dig a trench about a foot deep or more and carefully save the good soil, removing sand, gravel, stones and rubbish. Then I put in a six-inch layer of rotted manure. While manure is hard to get these days, your dairyman will doubtless supply you with enough for an asparagus bed—for a price—or, if not, get another dairyman. Then I fill the rest of the trench with the best soil I can get and mix with it, pulverized limestone—better than hydrated lime—and a commercial fertilizer, high in superphosphates. Twenty pounds of limestone and about three pounds of superphosphate for each 100 square feet of bed, or each 50-foot row should do the trick. But it must be thoroughly mixed with the soil. Then I let the bed rest through the winter.

Early in the spring I set out the roots of asparagus. The method has been greatly changed in a few years. Formerly two-year-old plants or roots were considered best, but now commercial growers seem to prefer one-year-old roots and as asparagus roots are cheap they buy or raise about twice as many as they will need, discarding the smaller roots or those which do not contain a sufficient number of eyes.

Perhaps the greatest change in starting a bed since my earlier days is in the depth to which the roots should be planted. Then they were planted in trenches sometimes six inches deep. Today many growers simply cover them with two inches of soil and firm it down

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with a board or plank. The size of your bed will depend upon the size of your family. A safe rule is to allow about a 25-foot row for each person. Rows should be spaced about four feet apart and the roots planted about a foot apart.

Needless to say, no asparagus should be cut the first year, no matter how successful you have been. The roots must be given a chance to get established. But that doesn't mean that the bed should be neglected. The weeds and grass between rows should be kept in check either with a sharp hoe, or with a wheel hoe, and those appearing in the rows themselves pulled by hand. It sounds like a lot of work, but it isn't. If you use a hoe, don't cut off the root crowns. My rule has been to mark the rows with a permanent garden line fastened to two stakes, I plant the rows directly along these lines. There may be a better tool for setting out a bed than your two hands but, if so, I haven't discovered it.

Another old notion about asparagus is that it is a plant of marine origin and some early books advocate treating it with salt. Modern growers as a rule don't do this, but they do say not to be sparing of manure, and fertilizers and even advocate an occasional dressing with wood ashes. Years ago, when manure was plentiful, after a bed had stopped bearing and the stalks were dying, they were cut down and the rows mulched with manure to remain all winter and be raked up in the spring.

If you follow these instructions you are bound to have good asparagus.

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—Owen D. Young

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